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GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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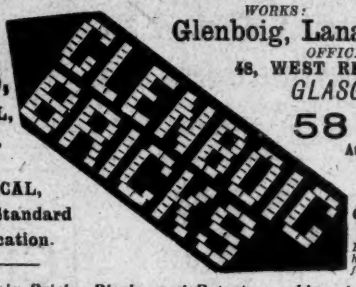

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VOL. CLVII., No. 3062.] WEDNESDAY, JANUARY 18, 1922. [74TH YEAR.

EDITORIAL NOTES.

John West.

JOHN WEST has crossed the bar, in the fullness of years. He has left the world the richer by his coming, and by the energy with which he employed those practical inventive faculties with which he was so generously endowed. We mourn a man whose life was replete with good and, for the gas industry progressive and profitable, work; we mourn a close friend; we mourn one who has been an outstanding figure in the gas profession, exceeding the memory of any practising gas engineer. And while we do so, our heartful sympathies extend to those whose privilege it was to call him father. He was a man among men. He had a personality which, through the variety of its components, we cannot associate with any other man in the gas industry. He was revered not only for his contributions to the technical and economic progress of the industry, but for himself. His individuality was formed by transparent characteristics and qualities which so harmonized, and were so innate, that they impressed all in the same forcible manner. Geniality, deep and quick perception, practicality, emphatic expression which came from conviction and carried conviction, always helpful, always happy and willing to advise and without any thought of self-interest or self-aggrandisement—such was John West. He could be assertive; but it was an assertiveness that came from convictions drawn from experience and an exploration of facts. He could not be placed in any particular school of thought so far as professional matters were concerned; for though an octogenarian, and the line passed by some three years, his ideas did not live in the past, and tradition or former practices failed to make a captive of him. His mind and brain were so agile, his views so broad, that in his professional life and work he advanced with the times—accruing knowledge to the very end. The things that had been were left behind, and those things that meant progress were accepted, and were developed. His work stands for progress; and it, it alone, is a sufficient monument to his memory.

Away down in those then little gas-works at Maidstone, we to-day picture him as a young engineer—some fifty years ago—designing a hand-worked machine to relieve retort-house operation of part of its laborious nature. He was a humanitarian. He pitied the men who had to work in the heat and dust of the retort-house; and he set his faculties in motion to bring about emancipation of those men from the most arduous of the conditions of retort charging. He succeeded. The economy that was to grow from this inceptive work was to come later. It was only the beginning to a great end. The machine expanded in detail and utility. Power was applied to it in one form or another. The machines developed to cope with any situation and design of horizontal retorts. They brought in their train much auxiliary plant—coal and coke handling and storage. They made of the retort-house a place in which engineers could exercise their talents in a way that had never been thought of or thought possible before. John West was a revolutionary of the right order. He used revolution to serve economy. His inventions did not appeal to labour. The old school of labour looked upon the means that lightened work and produced economy as simply methods of displacing labour. They could not see that mechanical aids elevated the man; and that economy, by cheapening the product, created demand and employment. And never has this been demonstrated more fully and truly than through gas supply. The mind runs back to-day many years since, when the first power stoking machine was installed at Beckton, when in an army of men there were unrest and dull murmurings, when there were threats because of this new thing which the men said they would not have. We were then there almost daily. With shirt sleeves turned up and overalls on, we see John West now, with dark faces about him, teaching men how to operate his machine. That day is afar off. Since then the West stoking-machines have found their place as part of the equipment of gas-works throughout the country and in all parts of the world. It was a great achievement; but the greatness of it was not traceable in the modesty of the man whose brain was the motive force from which it all sprang and developed. His skill, too, assisted to promote horizontal carbonizing plant from the primitive types to the scientific generative or regenerative ones as we now know them. His interests knew no bounds.

When the continuous vertical retort came in a more or less amorphous state, John West's practical and gifted mind saw constitutional weaknesses; saw where and how improvement could be effected; saw how the rate of carbonization could be controlled from the discharge end while the incoming coal could pass in and through by gravity; saw the means by which temperature could be regulated at will at any part of the length of the retort; and saw how the coke could be cooled before leaving the lower end of the retort, and the heat thus saved be applied to a useful purpose, thus promoting efficiency and economy. He passed on. Tentative experiments opened his eyes to the economies of steaming; and quite up to recent times, he has been one of the protagonists in this matter. He was always looking forward; and his mind and abilities were applied to advance. For him there was no end, no sufficiency, in those things that existed. There was always a beyond. His life in these things is an example, an inspiration, and a force. His was a versatile character, as witness the "recreation" from gas engineering that he found in farming and in refractory materials manufacture.

It was a big life, well lived. John West helped to improve the world through the gas industry. He succeeded well. He passes to his long rest with the esteem, affection, and gratitude about him of all men in the industry, for his work was invaluable, his presence always welcome and encouraging, his friendship priceless. He has passed hence. His work lives; and it is the foundation for still further development. Those who know of these things can say, and do say with all fervency, as our friend takes his place in the Great Beyond—"Well Done."

Dr. Haldane and a Carbon Monoxide Investigation by Gas Engineers.

QUITE a friendly attitude is being shown by Dr. Haldane in respect of the question of carbon monoxide in gas, though he will not shift from the ground upon which he has previously taken his stand. We believe fully that he writes with sincere conviction that he is right; but even Dr. Haldane may be wrong in his premises, and insecure in his fundamentals, or in the narrowness of the view which he takes of them. He has again written to "The Times;" and we see that he still allows no credits for progress in gas distribution, in the design of appliances, in application, and in public knowledge. In this matter, he lives still in the long-distant past, and continues to utilize in his argument American statistics derived from American conditions of gas supply and use of nearly a quarter of a century ago. The facts of those times drawn from America still constitute his guiding star in the matter of carbon monoxide. "The American "information," he now writes, "showed that nearly all the

"cases of poisoning occurred in bedrooms owing to the gas "being left turned-on. Part of these cases were clearly "accidental, part clearly suicidal, a small part clearly homi- "cidal, and the rest doubtful." No one can help the suicidal and homicidal parts. Carelessness there will always be; but knowledge of risk promotes care, and thus safety, more than the reduction of risk which is calculated to promote heedlessness.

Dr. Haldane does not take into account the racial diversity of the people of America; and he pays no attention to the fact that the gas business of Great Britain and Ireland has increased enormously—particularly among the poorer section of the community—since the Committee of which he was a member inquired and reported in 1898. All he can say is "cases of gas poisoning are now much less rare than they then "were." The gas industry has had about enough of these vague references and suggestions from men of science as to an increase in fatalities since the percentage of carbon monoxide in town's gas has been augmented. No data—nothing but generalities—are submitted by them on the point; and the basis of their comparison is the unsound one of the relation of the number of fatalities to the increase in the carbon monoxide content of gas. We should have expected something better than that from Dr. Haldane. Nothing could be more unscientific than his method of viewing the position. When Dr. Haldane or Prof. Bone can give data showing that the fatalities have increased in relation to increase of consumption, number of consumers, and points of use, then the gas industry will be prepared to regard with more seriousness what they have to advance. But the evidence is all the other way about. That is where the recent Departmental Committee have shown a more intelligent appreciation of facts than either Dr. Haldane or Prof. Bone. The former now writes: "After reading the report "of this Committee, I can come to no other conclusion than "that it failed to recognize the difficulties and the import- "ance of the question before it." Has Dr. Haldane read the whole of the evidence placed before the Committee? The personal views of Dr. Haldane or Prof. Bone cannot settle the matter. The Committee on their part may well be pardoned for thinking, having heard the evidence, that there are not a few things that Dr. Haldane has failed to recognize.

However, Dr. Haldane is in agreement with Prof. Bone that "there would be serious trouble, and also serious "risk of ill-considered panic legislation, detrimental to the "interests of both the public and gas undertakings which "render to it such extremely valuable services." The statement appears to be incomplete; but it is understandable. In this connection, he makes a suggestion: "As the "interests of gas undertakings and of the general public are "now practically identical, and as the report of the recent "Committee places a heavy responsibility on those who "have to direct gas undertakings, I should like to suggest "that gas engineers should themselves organize a thorough "investigation into the precautions needed in connection "with increasing percentages of carbon monoxide in domes- "tic gas. The results of such an investigation would, I "feel sure, prove of great value in avoiding future troubles." There is something more practical in this than in Prof. Bone's idea of a Public Commission after the inquiry that has taken place recently. But is it necessary to do even what Dr. Haldane suggests? Dr. Carpenter, in a letter published on Monday, unreservedly supports the idea, and thinks the Institution of Gas Engineers should get to work upon it without loss of time. The letter by Dr. Carpenter is signed in his capacity as Chairman of the Gas Companies' Protection Association; but it is not stated whether the Committee of the Association approve of Dr. Haldane's suggestion. We entirely fail to see the necessity of the Institution undertaking the task. The facts of experience and actual performance (the Departmental Committee had much evidence before them as to these) show that gas engineers are wide awake to the precautions needed; and the assumption of greater control over gas equipments—through specification, maintenance of fittings and appliances, and the hire system—by gas undertakings proves this to be the case. The greatest increase in gas consumption during the last twenty years has been through the prepayment system of supply; and the installation and maintenance of the fittings under that system are the work of the gas suppliers themselves. If Dr. Haldane lived for a space in the day-by-day work of the gas industry, he would be writing to "The Times" in praise of what gas undertakings are doing, and would not be viewing their affairs from the laboratory or the armchair of the study, or assessing danger from the standpoint of American practices and experiences of a quarter of a century ago.

On the same day, Sir William Pearce, M.P., who was the Chairman of the Board of Trade Committee to whom was referred the question, repudiated the suggestion of Dr. Haldane that the Committee had failed to recognize the difficulties and importance of the question. He says: "This was certainly not the case, for long and anxious con- "sideration was given to the point." The intervention of Sir William in the discussion suggests another point. The Committee gave to the inquiry a patient and exhaustive investigation; and explored thoroughly every aspect of the matter, with the view of giving a correct answer to the reference entrusted to them. In view of this, the two suggestions that have been made of further inquiry are (as we have said before) nothing less than an unmerited reflection upon the competence of the Committee. If this sort of thing is to be allowed, or to have effect in producing a review of decisions of Committees appointed for a special and definite object such as that under consideration, then the Government or Government Departments will find that men of ability will be very reluctant to give their services and time to investigations of this nature.

A Thin Gas Bill Session.

CASTING our memory back over a great number of parliamentary sessions, we cannot recall one (outside wartime) that has presented such a destitute appearance as the coming one will do in respect of Bills dealing with gas matters. Those good old times when the Committee-room corridors were alive with counsel, parliamentary agents and their clerks, professional engineers, promoters, opponents, and others interested in the measures ploughing their way through Parliament, appear to have completely vanished—at any rate, so far as gas and electricity legislation is concerned. The Board of Trade can now do much—indeed nearly all—that Parliament formerly did; and the Electricity Commissioners can render practically all the service that the electricity industry requires. Times change, and with them not only the men but the manner of doing things. The change in legislative procedure is an example. Last week we reviewed a number of local authority General Powers Bills; and, so far as gas is concerned, there is hardly a spark of interest in any one of them. This week, notice is given to four Bills; and they are the only ones that possess any real interest.

One of the Bills is being promoted by the Sheffield Gas Company, and a second by the Windsor Royal Gas Company. We link the two together because they both desire to adopt the South Metropolitan Company's plan of a basic price and dividend. This assures (as far as it is practically possible to give assurance) a minimum dividend, and, when the charge for gas is below the basic price, a sharing of any additional profits between the ordinary stockholders and the employee co-partners. Touching this, there has not yet been any pronouncement as to whether the Board of Trade can deal with the question of inaugurating the basic price and dividend system. At one time it appeared to have been satisfactorily settled that the Board could dispose of applications for the change, until the persistence of doubt in some quarters resulted in a consultation with the President of the Board, who desired more positive direction in this particular from Parliament. It seems to us that the Board is the only proper channel through which the basic price and dividend system should be initiated in the case of any gas company. It is only a variant from the sliding-scale. It applies to the therm system; and any subsequent change has to be effected through the Board of Trade. To decide that the Board cannot deal with the matter *ab initio* would be to establish a curious anomaly. The Sheffield Company have already a maximum price of 1s. 1·6d. per therm. The dividend on the "A," "B," and "C" stocks is limited to 5 p.ct. per annum; but this is subject to reductions in the case of the "B" and "C" stocks, and on any ordinary shares or stock forming part of the further capital of £600,000, if the Company's general charge for gas exceeds 1s. 0·4d. and 10·6d. respectively per therm. Now the Company are proposing a basic price of 9d.; and this will be the lowest basic price yet enacted. A Company in the position of that at Sheffield having adopted the South Metropolitan plan, will give a lead in this respect to other provincial gas

companies. [A late promotion by the Chester Gas Company also proposes the adoption of the basic price and dividend system; but the Bill is not yet available for notice.]

As to the other Bills, the Stoke-on-Trent Corporation have lodged a scheme for taking-over the Potteries station of the British Gas Light Company; their object being to consolidate the gas supply in their administrative area under the one municipal management, and so to co-ordinate the conditions of supply. The Stretford District Council and certain neighbours are taking advantage of the clause in the Manchester Corporation Act of last session, which empowers them to form a Joint Board by application to Parliament in the coming session, and to take from the Manchester Corporation the Stretford undertaking, which has been for so short a period in their possession. We are not convinced that the Stretford Council and their neighbours are doing the right thing in the interests of the consumers; and there appears to be a very pronounced difference of opinion in the district, as will be seen from a report in later pages of this issue. In both the Stoke-on-Trent and Stretford Bills, there is provision for applying within twelve months for conversion of the powers of charge to the therm basis. It is just as well to arrange for this in measures as introduced, as to place the obligation on Parliament to put a time-limit to the making of application to bring about the change. Beyond these measures, there is really nothing worth special notice.

James Robson and Gas-Engine Development.

IT is a pleasure to us to reproduce the greater part of the lecture that Mr. James Robson delivered last Thursday to the Midland Junior Gas Association. Gas-engine technology contains a great deal regarding the origin and development of the internal-combustion engine; and in the history much is said as to the cycle invented by Beau de Rochas and developed and perfected by Dr. Otto, as well as the Clerk cycle. But in it all little mention is made of the patient, persevering, original work of James Robson, who was the inventor of the two-cycle gas-engine, which the famous firm of Tangye introduced to the world in 1881. Robson was also the originator of the gas forging hammer. The son of the man who was a pioneer in internal-combustion engine work, and who made such important contributions to the bringing into being and the developing of the gas-engine, has now repaired the neglect of public acknowledgment; and so the lecture before the Midland Junior Gas Association will become historical. It is only right that due recognition should be made in history of those who, through personal modesty and perhaps environment, have been but little heard of, though their contributions to the advancement of scientific knowledge and work have been of incalculable value. Henceforth James Robson's contribution to the development and progress of the gas-engine cannot and will not be ignored; but he will take his rightful place in the history of those Britishers who have through invention helped to make great the name of their country. Robson was a Tyneside man; and from Birmingham and the works of Tangye the results of his labours emanated. The gas men in the North-East of England and those of the Midlands will be particularly interested in the lecture which we print to-day; and the interest we are perfectly sure will not be confined to them.

The Grate and the Fuel—Coal Selection and Coke Quality.

THE article by Prof. Boys in last week's issue, and the one by Mr. F. D. Marshall in the current number, on the subject of the domestic use of coke, induce us to follow-up the article that appeared in the editorial columns a fortnight since. The fact that Prof. Boys and Mr. Marshall have made their contributions, shows that the subject is one of considerable interest. In the first place, let us say that the change from a solid smoke-producing fuel to a solid smokeless fuel can best be brought about by persuasion; and having regard to the very evident and the large amount of enlightened opinion in favour of improved domestic heating methods, very little persuasion would, we think, be required so soon as it is shown that a smokeless equivalent to the open coal fire is available, or smokeless fuel at an equivalent price is obtainable. It must be confessed that even the most ardent reformers among us prefer an open fire these winter evenings; and apart from mere sentiment, there are considerations of hygiene in favour of which sight should not be lost. We can well understand that to the Continental mind, reared in contemplation of the closed coke stove and elongated stove pipe, or the earthenware charcoal pot or "scaldino," the open fire of the Britisher must appear to be the last word in luxury. Properly constructed, it need not in any sense be an expensive luxury. The fuel cost of running a glorious coke fire, with coke at 45s. per ton (or 4 lbs. per 1d.) is less than ¼d. per hour; the average hourly consumption being about 1½ lbs. Mr. Marshall, like many another, appears to confuse heat radiated from a glowing red surface and that from a dull surface—such as from a closed stove, which also transmits heat to the atmosphere by convection. To the highly sensitive mucous membrane of the Britisher, the latter, in excess, has always been more or less irritating, and therefore objectionable; and the fact is, we cannot change it.

Mr. Marshall's support in urging the Fuel Research Board to institute research and general utility tests of domestic heating appliances is all to the good. In this connection, the London County Council, who obtained special powers to deal with smoke nuisances, in their General Powers Act of 1910, are also "empowered to spend a sum not exceeding "£500 yearly in making experiments and investigations "with respect to smoke consumption and the abatement of "nuisances arising from smoke." It would be interesting to know to what extent, if any, this particular power has been exercised in the past. There is now surely no lack of material for investigation or competent investigators. The job simply wants putting in hand, in order to produce definite results. In the capacity of housing authorities, the London County Council, in these as in other architectural matters relating to such relatively minor details as drain-pipes and water-taps, should be not only preceptors, but guides and masters. The sum (£500) annually available for this purpose is ample; and we say emphatically that no further time should be lost, having regard to the extent of present and near-future building operations, in giving effect to the wise expenditure of the money in the spirit in which it was obviously intended when the Act was drafted over a decade ago.

In his article last week, Prof. Boys, when describing his method of adapting a well-type fire-grate to the exclusive use of coke, adds considerably to the knowledge on the question. The type of grate he mentions, as ordinarily constructed, is probably the least suitable for use with coke. He has, however, no undue difficulty in starting a coke fire—unless the coke is very wet. This goes to the root of the trouble experienced occasionally with coke in domestic use. Why should coke in any circumstances be very wet? The necessity for complete quenching in the interests of safety in storage and distribution goes without saying; to saturate the coke in any degree is going beyond what is necessary, and degrades the coke from the position of a first-class smokeless fuel to that of a third-rate substitute for cheap coal. The whole question of efficient quenching requires "taking up," as indicated by Mr. L. Lacey in his recent paper [see "JOURNAL," Dec. 21, p. 812]. While it is one of the most critical operations carried on at gas-works, having regard to its effect upon the commercial value of coke, it is frequently one of the crudest of operations—merely a spray of water of constant volume playing upon a varying quantity of hot coke.

The point is made by Prof. Boys that the main factor in controlling an open coke fire is the size of the fire maintained. We referred a fortnight since to the "N.C." coke grate, which not only provides an additional control by means of the ashpit damper, but the serrated formation of the refractory back and sides provides increased effective radiating surface; and this tends to promote quick ignition and convection currents from the front to the back of the fire. Another feature of the "N.C." grate is the adjustable damper (which can be supplied if required) in the canopy to control the circulation of air through the room—an important factor in promoting fuel economy, as pointed out last week by Prof. Boys.

The perusal of Mr. G. M. Gill's paper in last week's issue serves to strengthen ideas adumbrated, but more and more clearly conceived since the advent of the war and the coal strike, and the consequent degradation of coal generally, and particularly that purchased by gas undertakings. Of the 20 million (or so) tons purchased annually, probably one-half is sold as coke containing about double the potential thermal value of the gas produced in the process of carbonization; and apart from the adverse effect of excess

solid inerts upon the quantity and the quality of the gas and the other products of carbonization, their effect upon the thermal and commercial value of the resultant coke, in which they are necessarily concentrated, is probably one of the most serious aspects of the question of unclean coal. In addition to diminished thermal value, relatively soft and friable coke produced from such coal has an inordinate affinity for water, absorbing and retaining, as it does, an undue amount of moisture after quenching—thus further degrading the fuel value of the coke to the user, and, consequently, weakening its chance of success in competition with other and higher priced fuels. Having regard to the great importance of its bearing upon the price charged for gas, no effort should be spared that will tend to increase the revenue from coke. To a large extent surplus moisture in coke is within the control of the technical works staff; but not so the mineral impurities, the control of which is largely a matter of selection at the pits.

The South Metropolitan Gas Company's organization of selective methods of coal purchase on the spot is admirable; and the results are bound to be reflected not only in the make of gas, but also in the net evaporative value to steam users of the coke produced, and consequently in the commercial value and revenue derived from the coke. In our opinion, those whose responsibility it is to sell coke to the best possible advantage financially have, or should have, a large say in the matter of selecting suitable coal, as the revenue from this department of a gas undertaking is dependent, to an increasing extent, upon the quality of the coke product. Cheap power is the pressing need of industry to-day; and the keenness of competition between purveyors of solid fuel and of manufacturers in the purchase of fuel, renders it imperative that coke should contain only a minimum of ash, if it is to compete successfully with any but the poorest qualities of coal. The measure of success that is claimed for the London Coke Committee in promoting coke sales on scientific lines by the association of adjoining companies, suggests that a natural progressive step would be the extension of this association to embrace also the systematic selection and purchase of gas coal. In the idea itself, there is nothing new, except perhaps its co-operative application to the gas industry, as previously suggested in these columns. The information that would be collected as to when and where to purchase coal to the best advantage (having regard to the relatively narrow limits, geographically, within which gas-making coal is purchased) would be of great value to the industry generally. The only question is whether the organization should be national instead of local in character. Instead of being allowed to vary over wide limits (as they are by Mr. Gill shown graphically to do), the vital factors of volatile matter, ash, and moisture would, by such an organization, be stabilized within the narrowest possible limits, and, moreover, at the desirable maxima and minima respectively—thus tending not only to eliminate the necessity for frequent alteration to carbonizing conditions, but also towards more regular and consequently more efficient working of gas-works plant. In face of the "Fork *v.* Shovel" controversy, it is, as we have before said in the "JOURNAL," hopeless to depend upon either miners or colliery owners closely to classify or purify their products. Mr. Gill's suggestions in this connection, although admirable, must be regarded as a counsel of perfection. Meanwhile, it is for the gas industry to take action, and be once more up and doing on lines similar to those adopted when in similar difficulties in other directions.

The Two Hundred Goal.

When Mr. D. Milne Watson from the Presidential Chair of the National Gas Council was addressing the members in December, he referred to the vexation that had been caused in some quarters over the suggested slow rate of issue of Orders under section 1 of the Gas Regulation Act. Up to the end of September, the number of Orders issued was 101; and the President said the Director of Gas Administration was hoping to reach the 200 mark by the end of the year. His hope was realized. The notices of Orders in our first issue this month took the total to well over 200.

Combination of Gas and Electricity Undertakings.

A large proportion of the electricity supply of the country is in the hands of municipal authorities who also own the gas undertakings. Had those authorities had the prescience, they would, when originally considering their electricity schemes, have developed them in conjunction with the gas undertakings, and so co-ordinated the supply of the two agents for light, heat, and power, and thus done a wise thing in promoting the economical use of fuel, and so the conservation of our coal supplies. It is still open to those districts where there is not an electricity supply to develop one in association with the gas supply, and realize very obvious economies. This is good policy—at all events, it is something that should be looked into very critically by all authorities who are proposing to take up the supply of electricity, or who are contemplating reconstruction work, particularly in connection with their generating stations.

The Case of Barry.

We understand that Barry is going to consider its proposed gas-works extensions in relation to the supply of electricity for the district. The information has reached us that Sir Charles Bright and Partners (of which firm Mr. A. Hugh Seabrook and Col. H. W. Woodall are members) have been instructed to report on the matter. This, we believe, will be the first case in which the firm have dealt with both gas and electricity, although we know that they are dealing with other cases in which there are proposals under contemplation for installing electricity plant at gas-works, but where the firm are not dealing with the gas plant. In some of these cases, they are acting in co-operation with consulting gas engineers. The case of Barry is therefore of particular interest. It will be remembered that there was a scheme before the Council for expending £125,000 on the gas-works. The South Wales Electric Power Company stepped in with a scheme for supplying electricity, which it was said would save a considerable expenditure on the extension of the gas-works. This caused hesitation in the matter of the gas-works extensions. But their scheme would not mean a saving to the ratepayers. Whatever is done in the matter of electricity, money will have to be spent on the gas-works. That is inevitable. If electricity is wanted, then the whole question is which is the best method of procedure, so that the over-all expenditure on gas and electricity, and the subsequent working costs, are brought on to the most economical lines. This is the question that is now going to be considered and solved by advisers competent in both gas and electricity matters, and acting in co-operation.

Gas Coal Position.

The heavier buying of gas coal that was experienced before the Christmas and New Year holidays has ceased; and there has been an easing-off in inquiry and purchase. The reason for this is that gas undertakings find themselves well secured, as, though there may be temporary flights in gas demand owing to cold weather, week by week will find us nearer the spring, and so working under less pressure. The policy of buying in the open market is being largely resumed; and the practice will probably be continued, rather than enter into long contracts for full requirements, unless there is a further reduction of prices shortly. There is expectation that the next month or two will see further concessions. Anyway, there are no signs of any capacity on the part of collieries for improving the prices of gas coals. As to quality, the screened varieties are the ones most sought after, as gas undertakings find that there is more profit to be reaped from the better class coals, especially with the heavy railway rates which now prevail.

No Such Thing as a Normal Price.—In their report for the year 1921, the Indiana Public Service Commission, in arguing that there is no such thing as a normal price, remark that much was said during the past four years, when prices were rising, that there would be a time when prices would pass the peak, then decline, and finally reach a new normal, higher than the alleged pre-war normal. "We," they go on, "are now able to see that there is no such thing as a normal price. It has been found by experience that there was no pre-war normal; and the indications are that there will be no post-war normal. The practice of making valuations based upon certain alleged normals and alleged trends is a will-o'-the-wisp. Prices are yet chaotic; but they are upon a general decline. Engineers and experts in valuation matters who have appeared before the Commission and their engineering department never have agreed, and probably never will agree, upon what constitutes a normal price, or trend price, as of any period or time."

JOHN WEST.

IT is with profound sorrow that we have to announce the death of Mr. John West at 11.15 last Thursday morning, at his residence Alton Lodge, Park Crescent, Southport. Our friend was in his eighty-third year, and would have been, had he lived, celebrating his birthday on the 10th of March. Despite his great age, he has enjoyed fairly good health the last few years; and, indeed, up to Christmas Day he had not been attended by his medical man for eighteen months. The cause of his death was acute bronchitis, following a severe heart attack which occurred on Christmas Day, and from which he never really rallied. After his seizure, a repetition of attacks left him completely prostrated; and bronchial troubles supervened. Fortunately, he did not appear in any great pain, and was more or less conscious to the end. To every member of the family, while expressing our own deep sympathy, we know full well we can convey that of the whole of the British gas profession. In near and distant countries, the intelligence, we are sure, will awaken similar feelings among gas men; for wherever there is gas supply, there the name of John West is known, and his work is esteemed.

THE FUNERAL.

The funeral took place at the Southport Cemetery on Saturday afternoon, and, as was to be expected, was attended by a large and representative body of mourners. Prior to the interment, a service was held at Holy Trinity Church, with which place of worship the deceased gentleman had been connected practically the whole of the twenty years he resided in Southport. Here he was a sidesman; and he was a generous supporter of the Church and of the building fund of this fine Ecclesiastical edifice. The service was fully choral; the choir leading the singing. The Vicar (the Rev. Campbell Hulton, M.A.) conducted the service, assisted by the Rev. E. Harries (Hon. Curate). Mr. W. Marsden, A.R.C.O. (Deputy Organist), presided at the organ.

The chief mourners included the following members of the family: Mrs. Crass (daughter), Miss West (daughter), Mr. and Mrs. F. J. West (son and daughter-in-law), Mr. and Mrs. Frank West (son and daughter-in-law), Mr. and Mrs. Ernest West (son and daughter-in-law); Mr. Crass (son-in-law), Mrs. Harold West (daughter-in-law); Miss Phyllis West (granddaughter); and Mr. Arthur G. Bird (nephew). Among the many representatives of the gas industry present were: Mr. Samuel Glover, Mr. Arthur Valon, and Mr. J. H. Bainton (Directors of West's Gas Improvement Company, Ltd.); Mr. John Bond (Southport); Mr. Samuel Tagg (Preston), representing the Institution of Gas Engineers, of which he is a Vice-President, and also the Manchester District Institution of Gas Engineers, of which he is President; Mr. G. S. Frith, J.P. (Runcorn), Hon. Secretary of the Manchester District Institution; Mr. J. E. Blundell (Carlisle), representing the North of England Gas Managers' Association; Mr. W. S. Haddock (Warrington); Mr. J. P. Leather (Burnley); Mr. J. H. Brearley (Southport), representing the Manchester District Institution of Gas Engineers; Mr. G. P. Mitchell (Blackburn); Mr. J. Mitchell (Nelson); Mr. H. Banks (Northampton; Mr. F. Betley (Wigan); Dr. H. G. Colman (London); Mr. W. Buckley (Manchester); Mr. Mark Newsome (Chorley); Mr. George Dixon (Lancaster); Mr. G. W. Tooley (Manchester); Mr. Frank Hazelton (Secretary, Manchester Association of Engineers); Mr. Frederic H. Lamb (Director) and Mr. S. W. Tamplin (Managing-Director), Messrs. Donald Macpherson & Co., Ltd., Manchester; Mr. C. Dempster (representing Messrs. R. & J. Dempster, Ltd., Manchester); Mr. L. Orford (Manchester); Mr. P. Blair (representing Messrs. Parkinson and Cowan, Manchester).

Representing West's Gas Improvement Company were: Messrs. R. J. H. Sayers, M.Inst.Mech.E. (London Manager), A. E. Kirby (Secretary of the Company), H. Allchin, R. B. Glover, J. V. Barlow, W. Wild, T. A. Tomlinson, H. Clegg, A. C. Hovey, F. Wilson, F. B. Skidmore, J. Ogden, W. H. Trevor, P. C. Shapley, S. Andrews, H. H. Thompson, and A. D. M'Lennan, together with a number of employees representative of the various departments of the works. Also Mr. J. W. Fagan, General Manager and Secretary of the Derbyshire Silica Firebrick Company. In addition there were many other personal friends.

There were a large number of beautiful floral tributes; the senders embracing the many interests of the deceased during his lifetime.

SKETCH OF MR. WEST'S CAREER.

Mr. West entered the industry with which his life's work was destined to be so closely identified by being articled to Mr. John Eunson, Engineer to the Northampton Gas Company, under whom he received a sound practical training for his profession; and with him he was associated for a period of about fourteen years. Even at that time, the Company had an extensive stoves and fittings department; and of this our friend was entrusted with the management. When he left Northampton, it was to take up the position of Works Superintendent of the Hastings and St. Leonards Gas Company, in which he remained for about two years. Then came his first appointment as Engineer and Manager, in which capacity he undertook service with the Maidstone Gas Company.

EARLY RETORT-HOUSE MACHINERY.

It was while at Maidstone that he invented (in 1873) his first system of charging and drawing retorts. The early inventions embodied in this system will be found described and illustrated in Vol. I. of "King's Treatise on Coal Gas," published in 1878. This describes the system as being "a combination of machine and hand labour. The different operations are performed by hand by the aid of machinery, also actuated by hand, which relieves the workman of the most trying portion of his labour, while otherwise accomplishing better results than are obtained by the ordinary methods. The principal ends sought to be attained by the new system are the cheapening of the cost of carbonization by the reduction of labour in the retort-house, the amelioration of that labour in so far as it affects the workman, and the production of an increased quantity of gas of a better quality, by using diminished charges of coal broken into small pieces, and distributed in an even and uniform layer in the retort; the charges being of four hours' duration." His first experiments in machine stoking were made with a retort open at both ends; the mouthpiece at one end being sufficiently long to hold a charger, which was supplied with coal from a hopper fixed on the top of the mouthpieces—the charger-rod passing through a stuffing-box in the mouthpiece lid. The front end of the charger was provided with a movable plate, which performed the service of pushing the coke forward into the chamber at the far end; the coal being deposited while the charger was being withdrawn. After lengthened experience, however, when working on a practical scale, he came to the conclusion that the results obtained would not warrant an extension of the system. But recognizing the advantages of mechanism for distributing the coal in the retort and pushing out the coke, he turned his attention to securing them while avoiding the drawbacks of his first methods.

A bench of retorts was erected with a mouthpiece at each end; the one at the farther end of the retort being for the removal of the coke. A travelling trolley was then devised by Mr. West, running upon rails in front of the retorts; and within the framework of the trolley was contained a hopper for carrying the coal, as also the charger for pushing out the coke and distributing an even layer of coal in the retort. In addition, he then used for the first time coal breaking and elevating machinery to supply the charging apparatus. Later it was decided to block-up the end of the retorts with 14 in. of brickwork; and then the results realized his utmost expectations. All the stoker had to do was to turn a handle to fill the charger, then run it in, turn the scoop over, and withdraw it from the retorts. In this way was brought out Mr. West's manual machinery, which, after being adopted at Maidstone, was very soon installed in various other towns. Later, he designed a coal breaker, elevator, and conveyors to carry the broken coal into the retort-house, with fixed hoppers in such a position that the machines travelled under them. By having an adjustable hopper on the charging machine, capable of carrying sufficient coal for a dozen or more charges, with a frame attached for carrying the charger, the item for coal trimming and handling was reduced to an exceedingly low figure.

DRIVING BY COMPRESSED AIR AND BY ROPES.

The next step in development was the addition of the necessary parts for working the manual machine by compressed air. The machines first made for use with compressed air were but little different from the manual kind; but additional strength was found necessary, and was added, step by step, as the power was increased. The first machinery of this kind was erected in 1881 at the Rochdale Road Works of the Manchester Corporation. This type was, of course, subsequently very widely adopted. The first two sets of Mr. West's rope-driven machines were installed at the Blackburn Corporation Gas-Works. A small steam-engine was provided, and a line of shafting fixed at right angles to the stack, with pulleys for driving the rope. The rope extended the whole length of the house, without any support for the bottom, or driving, strand, except the machines. Beckton was among the other places where this system was adopted. Subsequent to the development of compressed air—in connection with which Mr. West devoted much attention to economical methods of compressing the air and transmitting it—he applied electricity to the same objects, achieving great success. Readers need hardly be reminded that his machines have been adopted all over the British Empire, the European Continent, and America, as well as in China and Japan. In addition to his successful introduction, as has already been mentioned, of mechanical coal-handling plant—which gave a fillip to all mechanical stoking operations—the mechanical transport and handling of coke is another direction in which Mr. West did excellent work; his hot-coke conveying plant being a notable example of machinery dealing with a most difficult problem. Thus of him may it be truly

said that he not only benefited the working man by lightening his arduous tasks, but he also benefited the gas industry itself by rendering possible enormous economies in the cost of production.

HEATING OF RETORT-SETTINGS.

Apart from retort-house plant, Mr. West devoted a great deal of attention to other processes of manufacture. In fact, for many years onwards from 1873—the date of his first patent for the use of machinery in the retort-house—evidence of the possession by him of exceptional mechanical ability is afforded by the records in the Patent Office—his applications being both numerous and varied in character. The introduction of machinery into the retort-house necessitated attention to the method of heating retorts economically; and in this direction he was one of the first to recognize the importance of the regenerative system. Some forty years ago, he installed one of the first regenerative settings in the United Kingdom, and afterwards perfected the system which has since become so popular. To mention just a few of his other patents, it may be said that in 1898 he patented his hot-coke conveyor; and in subsequent years further patents were taken out for all kinds of retort charging and discharging machinery, including, in conjunction with Mr. W. J. Carpenter, of Great Yarmouth, a scoop for effecting the former operation. At the request of the Committee, he showed, at New Swindon, in 1890, the models of his manual stoking machinery to the members of the South-West of England District Association of Gas Managers; and this caused an added amount of interest to be taken in the subject.

GLOVER-WEST VERTICAL RETORTS.

Following up the researches of Mr. William Young regarding the distillation of shale for oil production in vertical retorts, he took up the patent of Messrs. Young and Samuel Glover, and applied and perfected this principle in the development of the continuous carbonization of coal in vertical retorts for gas production, under the system which is now known the world over as the "Glover-West System." One of the most noteworthy inventions in connection with Mr. West's early patents for verticals was the method of extracting the heat from the residual coke prior to its discharge from the retort, using this heat for heating the secondary air supply, and cooling the coke to a point which obviated the necessity of subsequent quenching. Later on, the introduction of steam for the manufacture of water gas and increased residuals occupied his attention.

The activities in this connection of Mr. West and his firm are so well known by everyone in the gas profession that extended reference to them at this moment is unnecessary. Even during the war period researches were continued, the fruits of which, as the "JOURNAL" volumes show, were given to the industry in several publications. The first of these was Mr. J. E. Blundell's paper on "Some Experiments on Steaming in Continuously Operated Vertical Retorts," read before the Manchester District Institution of Gas Engineers in October, 1917. Then, many who read these lines will still retain a vivid recollection of the valuable paper which Mr. West submitted to the Southern Association of Gas Engineers and Managers in November, 1917, and the spirited manner in which he maintained the discussion. The subject taken by him was "The Most Economical Method of Carbonizing Coal for Supplying Light, Heat, and Power." Reference may also be made to the Fourth Report of the Gas Investigation Committee, containing tests made on the Glover-West vertical retorts at the Uddingston Gas-Works; and the report on "Steaming in Vertical Retorts," issued as the Report of the Fuel Research Board for 1920-21, and containing the results of tests made under the supervision of Sir George Beilby.

FROM MAIDSTONE TO MANCHESTER.

Returning to Mr. West's career, at the stage where a break was made for the purpose of referring to his successes as an inventor, it will be admitted that in 1880 came what might be termed a turning-point in his life; for it was then that he left Maidstone on his selection to fill the important position of Chief Engineer to the Manchester Corporation Gas Department. During the time he was with the Corporation, he carried out extensive alterations and improvements to the gas-works, including the introduction of the regenerator system of heating retorts; and he practically completed the Bradford Road Station.

However, another turning-point was soon reached—in 1884, when he severed his connection with the Manchester Corporation, and embarked upon the business with which his name has ever since been connected. As has already been mentioned, while at Maidstone he devised and practically applied his mechanical system of stoking retorts; and a Company—West's Gas Improvement Company, Ltd.—was formed to construct and supply the plant. The Company acquired the Albion Iron Works, at Miles Platting, and transferred to them the business previously carried on at Maidstone—Mr. West becoming the Managing-Director, and in due course the Chairman, of an undertaking the extent of the operations of which has, aided by his unflagging energy and indomitable perseverance, continued steadily to grow from then right down to the present time. He was also the founder and Chairman of another flourishing business—that of the Derbyshire Silica Firebrick Company, whose extensive and interesting works at Friden were visited by the members of the Manchester District Institution of Gas Engineers in July, 1920, when Mr. West himself welcomed the party, showed them round the works, and gave a general outline of the various processes of manufacture.

TECHNICAL ASSOCIATIONS.

As a contributor of addresses and papers to the proceedings of technical organizations of which he was a member, Mr. West placed the gas industry under a deep debt of gratitude. He was admitted to membership of the British Association of Gas Managers in 1869. Subsequently he passed into the Gas Institute, of which he was President in 1894; and he was one of the Trustees at the time when the amalgamation with the present Institution of Gas Engineers took place. He was then elected an honorary member of the combined organization. He was also an early member of (as it then was) the Southern District Association of Gas Engineers and Managers, of which he was President in 1877. Though indisposition kept him away from the first meeting during his year of office, he had prepared an able address, which was read by the Hon. Secretary (Mr. J. L. Chapman). On the occasion of the spring meeting, the members had the pleasure of visiting the Maidstone Gas-Works. Curiously enough, the Southern Association, who were thus one of the first of such bodies to reap the benefit of a contribution from Mr. West, were also the last to be favoured with a paper by him. Upon taking up his residence in Manchester, he joined the Manchester District Institution of Gas Engineers, of which he was in 1920 made an honorary member, in recognition of the valuable work he had done for the gas industry. He was also President for two years of the Manchester Association of Engineers (1890-1891), in which organization he always took an active interest. He was elected a member of the Institution of Civil Engineers in 1884, and of the Institution of Mechanical Engineers in 1894.

Honour was done him by the Institution of Gas Engineers by the award both of the silver medal and of the "Birmingham" medal. In presenting the latter, at the meeting in 1918, the late Lord Moulton (who was then President) said he was satisfied that to no one could it have been given who merited it more, or whose reception of it would have given greater pleasure to the members. No more veteran supporter of the cause of gas could, he added, be found than Mr. John West, who could look back over a long series of years in which he had successfully employed his great ability and great experience in the advancement of the gas industry. At the same meeting, Mr. West gave an example of that spirit of generosity and kindness of heart of which his friends so often found evidence, by handing over a donation of £100 to the Benevolent Fund of the Institution.

PERSONAL MATTERS.

Mr. West was a J.P. of Manchester City, and a member of the Manchester School Board prior to its transfer to the Educational Committee. He was one of the few remaining of the first members of the Evening Star Lodge, of which he had of recent years been made an honorary member. In agriculture, which is outside the gas industry, but nevertheless closely connected with it—as was shown by one of the Institution papers, for which he was awarded a medal—Mr. West took the keenest possible interest; and, thorough in everything to which he put his hand, his attainments as a practical farmer were of no mean order.

His son, Mr. Fred J. West, who is General Manager of the firm, has done good public work. He is an Alderman of the Manchester City Council; and, as did his father, he takes great interest in local and other institutions. Among the public duties undertaken by him is that of representing the Manchester Corporation as a Director of the Ship Canal. Also like his father before him, he has taken the Presidential Chair of the Manchester Association of Engineers. During the war, too, he was President of the Manchester District Employers' Federation, and rendered valuable service in connection with the settlement of labour difficulties.

By his first wife, Mr. West had one son—the late Mr. John E. West, who was a Director of the firm. The family by his second wife consisted of five sons and two daughters. In addition to Mr. Fred J. West, two other sons—Frank and Ernest—are active members of the firm. Arthur is engaged in farming; while Dr. Harold West, who served with distinction in the army, is now in the Indian Medical Service.

Mr. John West enjoyed considerable practice as a consulting engineer in connection with public service undertakings; but he never allowed his firm to be interested in contracts associated with his consulting practice, except where his particular plant was desired to be introduced. He trained many men who now occupy leading positions in the gas industry; and his wise counsels and kindly interest in their progress have been appreciated and gratefully remembered.

APPRECIATIONS.

It has been my privilege to know the late John West for over thirty years, not only in business, but socially. At times I have gone to him with my business worries; and he was ever ready to give me the benefit of his great experience. We have been neighbours in Southport for many years; and it was always a pleasure to spend an evening with him over a quiet pipe, and to discuss our mutual friends in the gas profession. It will be difficult to find a man to take the place in the gas world that old John West held.

Knott Mill, Manchester. S. W. TAMPLIN.

Recollections of One of the Younger Staff of West's Gas Improvement Company, Ltd.

We attended the "Governor" to his resting place in his 83rd year. The significance of the figure—83—comes home to one of the younger staff. The strong man with whom we threw in our

lot, this full tide on which we launched our youthful boats, this energetic, dominating figure in the world of gas engineering, was already at the age of three score years. And to us the full force of his vigour was yet to come. The present writer confesses that he did not realize it until the end.

Certainly the great feature of the life of Mr. John West is that right to the very end his creative faculty persisted. The twentieth century, which found him sixty years old, saw the mechanical charging and discharging of retorts and the mechanical handling of materials in and out of the gas-works accomplished facts; and Mr. John West could have rightfuliy claimed that the triumph was his. But no thought of retirement occurred to him. Already the scoop-charger was succeeded in its creator's own mind by three other forms of apparatus for charging and discharging horizontal retorts; while the inclined retort was examined with a perfectly open mind to which more than one fine installation bears witness.

The century was not more than a very few years old when the vertical retort appeared and, with it, the prospect of continuous carbonization. John West threw himself into the new task with a vigour that kept him well ahead of his forces, and left us no time to wonder at it. The whole of the detail, the whole of the inventive energy which goes to the creation and perfection of a new process, was either directly due to him or inspired by him, for he insisted on giving full consideration to ideas from all quarters. How well the present writer remembers scenes in the drawing office—for the "Governor" knew that this was the "strategic point!" Some youngster at the board would be diffidently struggling with a new idea. His senior would be trying to give expression to it for him when the Governor would brush all intermediaries aside and draw the suggestion from its original source.

An engineer knowing his business in every detail, a leader really going before, a worker making efforts always in excess of what he demanded of others, a fighter ready always to tackle any difficulty, a man, every inch, with no doubt his full share of the fallings of men, but with a warm human interest in those associated with him. We of the younger staff wish to stand with the older men and salute John West at his passing.

THE "ENGINEER" ON THE COMPOSITION OF GAS.

Carbon Monoxide and Accidental Deaths.

In a review of gas engineering during 1921, the "Engineer" makes the following remarks upon the composition of gas, and the percentage of carbon monoxide.

Though the main provisions of the new Act were put into operation during the year, there still remained to be settled some of the minor, but nevertheless important, features. Chief among these were the questions in connection with incombustibles and carbon monoxide in town's gas, which had been referred to two Committees consisting of members well known in the field of fuel technology. Needless to say, the uncertainty which prevailed in connection with the possible restriction of certain gaseous constituents gave rise to a good deal of anxiety on the part of gas engineers. It was rightly felt that the modifications introduced by the Act were in themselves sufficiently sweeping, without being encumbered with additional strictures, the practical value of which was open to considerable doubt. There can be no question that during the war the proportion of incombustibles in town's gas exceeded on some occasions the limit of propriety. Considering the difficulties which were laboured under, the fact was excusable; but as gas was then sold on the basis of cubic feet, the consumer had some cause for complaint. To-day, however, diluents are of no commercial value to the purveyor; and the case against them is entirely changed when it is borne in mind that, if the consumer gets them, he gets them free of charge. In this connection, too, it is important to remember the generally accepted opinion that a British thermal unit is always capable of giving a definite duty whether it be supplied in a concentrated mixture or one of leaner propensities. Fortunately, the Incombustibles Committee appreciated the true position. They decided to make no recommendation in the way of restriction, but suggested that the position should be reconsidered in three years' time.

So far as the limitation of carbon monoxide is concerned, there can be no question that it adds to the toxicity of town's gas; but it is not solely responsible for it. There would seem, therefore, to be little object in restricting one not altogether desirable constituent, if such restriction only diminishes, and does not eliminate, the danger complained of. All the evidence before the Committee went to show that the proportion of truly accidental deaths from gas poisoning was negligible; the majority of fatal cases being represented by wilful self-destruction, in which case—from the humane point of view—the presence of carbon monoxide may be regarded as an advantage rather than a drawback. The Committee evidently appreciated that the matter was largely one of sentiment; for they concluded that it was neither necessary nor desirable to prescribe any limitations. The matter was one of more than ordinary importance to the gas industry; for the limitation of carbon monoxide—and inerts, too, for that matter—would undoubtedly preclude the development of those processes which show considerable promise in the way of producing cheap therms.

PERSONAL.

MR. THOMAS GOULDEN'S ELEVATION TO THE BOARD OF THE GAS LIGHT AND COKE COMPANY.

Hearty congratulations will be passed to Mr. THOMAS GOULDEN, the Chief Engineer of the Gas Light and Coke Company, upon his elevation to a seat at the Board of the Gas Light and Coke Company. The vacancy occurred by the death of Mr. H. J. Waterlow. The election of Mr. Goulden took place last Friday; and it is a fitting pediment to his professional work for the Company. It was in 1884 that Mr. Goulden joined the staff of the Company as Assistant Engineer at Beckton; and from that position he ascended, in 1898, to the Chief Engineership of the station in succession to Mr. John Methven. In 1904, Mr. Goulden became Chief Engineer of the Company, upon the retirement of Mr. G. C. Trewby. Last year he was President of the Institution of Gas Engineers.

MR. THOMAS HARDIE APPOINTED CHIEF ENGINEER.

It is with great pleasure, which will be shared by a large number of his professional colleagues, that we have to announce that Mr. THOMAS HARDIE has been appointed by the Board of the Gas Light and Coke Company to the office of Chief Engineer. This change in Mr. Hardie's official capacity has been hastened by the elevation (mentioned in the previous paragraph) of Mr. Goulden to a seat at the Board. This appointment of Mr. Hardie to the Chief Engineership of the Company is only the consummation of what the gas industry knew was a foregone conclusion when he was appointed Deputy Chief Engineer to the Company at the end of the summer of 1920. That appointment was made in anticipation of the time when Mr. Goulden would, in the ordinary course of things, have retired from the Chief Engineership; and it was equally certain in the gas profession that the Board of the Company, and particularly the Governor, Mr. D. Milne Watson, would not lose the intimate knowledge which Mr. Goulden possesses of the technical affairs of the great Company with which he has had such a distinguished connection. Mr. Hardie is this year's President of the Institution of Gas Engineers; and this fact makes the more interesting his appointment to the Chief Engineership of the Gas Light and Coke Company. Never before in the history of the Institution of Gas Engineers has that body had the unique experience of having, two years in succession, Presidents who have occupied the prominent position of Chief Engineer of the largest gas company in the world. Never before has the Gas Light and Coke Company had two Chief Engineers who have in succeeding years been the Presidents of the Institution, and probably never again will such an experience be that of either the Institution or the Company.

At the Hilary Term Examinations of Students of the Inns of Court, held at Middle Temple Hall last month, Mr. GEORGE JULIUS WEBBER, a Member of Middle Temple and eldest son of Mr. J. Webber, Managing-Director of the Provincial Incandescent Fittings Company, Ltd. ("Pifco"), entered for his Bar Final Examination, and, out of 134 students, he distinguished himself by gaining a first of firsts, for which he was awarded a studentship of 100 guineas per annum, tenable for three years.

At the Gas Offices, Bute Terrace, Cardiff, last Saturday, Mr. THOMAS W. ANDREWS, Chief Collector, was presented with a handsome clock in rosewood, as a token of esteem from the staff upon his retirement through ill-health. Mr. Andrews entered the Company's employ as a lad in 1875, and has a record of 46 years' continuous service. During this long period he has seen, and participated in, the phenomenal growth and development of the Cardiff undertaking. Mr. R. J. Auckland (Assistant Secretary) was in the chair; and short speeches testifying to Mr. Andrews' long and faithful service were made by Messrs. H. D. Madden (Chief Engineer), T. Taylor, T. Noall, J. B. James, and Wilfred Jones. The presentation was made by Mr. George Clarry, F.C.I.S. (the General Manager and Secretary), who referred in glowing terms to Mr. Andrews' earnest and devoted attention to duty, his perseverance and conscientiousness, and his uprightness of character. They were exceedingly sorry to lose such a valuable and efficient officer, and trusted that he would be spared for many years to enjoy the blessings of his well-earned retirement. Mr. Andrews, in responding, said that no words could adequately convey his gratitude for the gift and the very kind expressions accompanying it. He deeply regretted having to sever his connection with the Company, but obligation left no choice.

There is to be a meeting of the Yorkshire Junior Gas Association in the Bradford Corporation Gas Showrooms next Saturday afternoon, when the President (Mr. P. M'Nab, of Low Moor) will deliver his Presidential Address.

ELECTRICITY SUPPLY MEMORANDA.

CERTAIN of our electrical contemporaries have been captured by the recent leader in "The Times" on "Domestic Gas," which was the subject of editorial comment in the "JOURNAL" a fortnight ago; and last week we dealt with the correspondence which it developed.

The Dupes.

Just as "The Times" disclosed its utter poverty of knowledge of the subject of carbon monoxide in town's gas, so the electrical papers have equally declared their nescience so far as this subject is concerned, by their acceptance of our morning contemporary's simplicity. "Meteor" of the "Electrical Times" was severely bitten. When a fire is attributed by a daily paper to a "short" he sneers, as though such a thing could not happen. When people are electrocuted at voltages ranging down to a much lower level than the normal pressures of electrical distribution, he passes over the matter with almost painful silence. When "The Times" accepts the dictum of a scientific man who refuses to apply the tests of practical experience to the terrible risks his imagination conjures-up, "Meteor" faithfully follows the feeble journalistic backing of the morning paper, and solely because it is up-against gas. He quotes the leader in that paper. We wonder whether he will quote the leaders in our last two issues. He refers to the poisonous character of carbon monoxide. Every schoolboy knows that; what every schoolboy and "Meteor" do not know is that carbon monoxide is a valuable heating agent among the gases owing to its great radiating power, and its usefulness in promoting flame temperature. But he has learned that the amount of water gas is "now nearly three times what Sir William Ramsay and Dr. Haldane advised as a comparatively safe maximum." What does our journalistic friend mean by this? Is it that the amount used is nearly three times that which the two scientists twenty-two years ago suggested was not a safe limit? Or is it that the amount of carbon monoxide is now, where water gas is used (it all depends on the proportions), three times what was considered a safe limit? As we say, the suggestion was made twenty-two years ago, before the use of water gas had developed to any extent. Since then we have had several years' war, and three big coal strikes. During these periods, the fuel supplies of the country were supplemented hugely by the supply of water gas—running up occasionally in certain districts during the last coal strike to 60, 70, and 80 p.ct. of the total mixture. What happened? Nothing more than usual in the way of fatalities. And all the statistics brought forward at the recent inquiry by a Departmental Committee showed what a clean sheet in respect of fatalities the gas industry can show.

Percentage Figures.

What Sir William Ramsay and Dr. Haldane advised twenty-two years ago (long before the experience had accrued which we have now) was revised at the recent inquiry by Dr. Haldane—scientist and not gas practitioner. He then put at 20 p.ct. the maximum percentage of carbon monoxide that he would allow in the mixture of coal and water gas. Innocent "Meteor" now writes: "In ordinary coal gas, says an article in 'Nature,' there used to be 6 or 7 p.ct. of carbon monoxide. Water gas contains 42 p.ct., so that if to coal gas already containing some carbon monoxide one adds about 33 p.ct. of water gas, the CO content amounts to an extremely high figure." "Meteor" makes himself ridiculous. An "extremely high figure!" If he calculates the quantity of carbon monoxide in 67 p.ct. of coal gas and the amount in 33 p.ct. of water gas, he will find in the mixture that the carbon monoxide content is within the 20 p.ct. suggested by both Dr. Haldane and Prof. Bone. His comments prove that he knows nothing whatever about the matter, nor about the facts of experience since water gas has been supplied, during which period the number of consumers, the uses, and the consumption of gas have had manifold increase. We have not the slightest doubt the electrical industry would be pleased if it could show a roll of electrocutions as short as the roll of gas fatalities in proportion to the number of consumers and the points of use. "Electrical Industries" is more moderate in its comments; but it seems to get a little mixed between percentages of water gas and percentages of carbon monoxide, which is a common error of the unversed critics.

Revenue Value of Small Appliances.

The writer of an article in the "Electrical Review" points out that many electricity consumers will adopt small appliances, and pay lighting rates for current used by them, rather than go to the expense of duplicating wiring in order to get energy at power rates. He is desirous of encouraging the use of the more expensive current, because this sort of thing is profitable—if a large business can be done. For instance, take irons, small hot-plates, and bedroom radiators. The revenue to be obtained from them (supposing they get the desired adoption) aggregates a considerable amount. Take a district having some 6000 electricity consumers. If 50 p.ct. of the houses connected to the cables each had an iron in use an average of two hours per week, the aggregate consumption in forty-eight weeks per annum would be 144,000 units. If the charge made was 7d. per unit, the revenue would amount to £4200. If 25 p.ct. of the houses used one hot-plate each an average of only three hours per week, in thirty weeks per annum 67,500 units would be used, which at 7d. per unit would produce £1968. If in 25 p.ct. of the houses connected to the mains, a radiator was in use on an average of three hours per week for twenty weeks per annum, 45,000 units would be used, which at 7d. per unit would yield £1312. A few fans, toasters, curling-tongs, or shaving-water heaters would bring the possible revenue up to £8000 per annum—at least £4000 profit after allowing a fair sum for maintenance. Business on these lines, it is urged, should be catered for on the large scale; and now is the time to press forward the work of business building by means of small appliances at lighting rates. We do not quite like the look of this. The load so obtained is an off-peak, daylight one; and the proposal suggests the making of money by getting the better of consumers by means that are not altogether fair.

Taxing Electric Motors.

The users of electric motors in Dundee have had a shock. What are regarded as exorbitant taxes on motors are being levied. There are some 500 motors in the area; and they have been enjoying freedom from taxation. The demands from the rating authorities were a surprise; and it is said that in some cases the taxes on the motors will in a few years exceed the total paid for the latter. The "Electrical Review" explains that the new system of rating was provided for under section 42 of the Lands Valuation (Scotland) Act, 1854, as amended by section 1 of the Lands Valuation Amendment Act, 1902. According to these Acts, all machinery "for the purpose of producing or transmitting first motive power is heritable;" and thus electric motors come within the taxable ambit. The rateable charge on these machines is 3s. 4½d. per £1 valuation on owners and 7s. on occupiers. It was only last year that a survey of the city was made with the object of ascertaining all those who used electric motors; and the taxation was imposed for the first time this year. It is said that the attitude of a number of electric-motor users in Dundee is that rather than pay the tax they will get rid of the motors. The manufacturers must have power; and we take it that other means of obtaining power would also be subjected to taxation.

Free Wiring.

The free-wiring discussion in the "Electrical Times" continues; but it draws no nearer to a confirmation of Mr. Nisbett's proposal that this should be revived as a means of increasing the electricity business. The balance of argument is decidedly hostile to him. Some oppose the plan seriously; others subject it to ridicule. An example of the latter is Mr. J. E. Ellis, the Borough Electrical Engineer of Morley; and no doubt his view is that of many others. Free wiring as a business-building policy is a delusion and a snare. In the bulk of cases, it would be unprofitable; and if the supply is given on the rental system, experience shows that the care exercised at the start in the use of lights generally develops into neglect and waste. Mr. Ellis said he does not agree with Mr. Nisbett unless that gentleman is prepared to go the whole way, and will place a man from the electricity department on each consumer's premises, so that, when the consumer requires a light, the man would be there to switch it on for him. In fact, his jocularity, or contempt for the proposal, induces him to suggest that each man should be provided with a suitable livery. This idea might go a long way towards solving the unemployment question. Mr. C. Turnbull, the Borough Electrical Engineer of Tynemouth, treats the matter very seriously; but he, too, is in opposition. He is of opinion that the increased costs involved would do more harm than good to an undertaking. The scheme might attract a host of small consumers with bills of about £3 per annum or thereabouts. But such consumers do not pay; so an undertaking is in a better financial position without them. Then Mr. Turnbull speaks of a further difficulty with houses wired on the rental system; and this he illustrates by an incident. "I met a man," he writes, "who was looking melancholy. On asking what was the matter, he explained that he had bought a house which was wired on the rental system. He gave the owners of the wires notice to take out the installation, and to reinstate the damage done in consequence. Eventually for £5 he bought a £20 installation. The tragedy which oppressed him was that, had he stuck out, he might have got it for £3!" Mr. Nisbett is doing badly in getting adherents to his free-wiring scheme.

Reductions of Price.

There is a steady stream of reductions in the prices of electricity. Consumers naturally expect this, with the costs of materials and goods falling all round. The increases in electricity charges that occurred during the war are being whittled-down in favourably situated places. But there are not a few districts where deficits have been a perpetual nightmare; and in these places reductions cannot be thought of until (if ever) surpluses come to gladden the hearts of the station engineers and administrators of the undertakings. In some quarters, indeed, increases and not decreases are still being contemplated. Circumstances alter cases. Of course, very few responsible electricians anticipate reaching the level of pre-war prices for some time to come—perhaps such a happy state will never be realized. It is pretty certain that coal will never get back to its pre-war figure; and this must have its effect on all products. Labour too, come what may, is resolved that pre-war wages are out of the question, and that a better standard of living must be maintained. We hope

the country will be able to afford it. Of course, labour may propose, but economic circumstances will dispose. That is a lesson which has created a very awkward situation for the extremist element in the labour world; and the section of that world identified with electrical labour seems to have in its leadership rather a large proportion of men with extravagant views and inventive faculties which lead them to autocratic and fatuous acts. These make observers wonder at times why the intelligent members of the rank-and-file allow them to stay in the position of leaders. However, we started to write about reductions; this labour question only comes in as an item in the accumulated obstacles to the realization again of pre-war charges for electricity.

MONAZITE AND THE MANTLE TRADE IN 1920.

In a lengthy article on "Monazite," which appears in "The Mineral Industry for 1920" (issued by the M'Graw Hill Book Company this month), Mr. Sydney J. Johnstone, B.Sc.(Lond.), A.I.C., says that during the year named the exports of thorium nitrate to the United Kingdom increased very considerably.

Writing, it should be remembered of 1920, he makes the following remarks with regard to the incandescent mantle trade.

The incandescent mantle trade of the United Kingdom is [1920] being seriously affected by competition with foreign imported goods, the increase of which is shown below.

Incandescent Gas Mantles Imported into Great Britain.

Source.	1918.	1919.	1920.	
	Value.	Value.	Quantity. Gross.	Value.
	£	£		£
Germany	..	421	21,359	51,710
Netherlands	..	5,955	19,949	41,409
Belgium	..	2,783	21,663	54,225
France	323	167	1,370	3,579
Switzerland	..	2,413	3,962	8,672
Italy	26,492	16,405	8,769	13,817
Austria	..	..	559	1,267
United States	..	131	283	1,663
Other countries	..	3,496	445	874
Totals	£26,815	£31,771	78,357	£177,216

It seems probable that the exports from certain of the above countries represent material largely of German manufacture. Great Britain exported during 1920 about 51,737 gross of gas mantles, valued at £171,147.

A report on the position of the incandescent mantle trade of the United Kingdom by the Incandescent Mantle Manufacturers' Association of Great Britain showed the progress since 1913.

—	Output in Million Mantles.	Capital Employed.	Workpeople Employed.
1913	23·7	£440,670	1843
1920	82·3	1,525,710	3783

The report also threw some interesting light on the German pre-war prices for export, as the figures given indicate that the factory prices in Germany (for home consumption) were from 1·5 to 3·2 times those at which the goods were sold c.i.f. London. The price charged in London for the German mantle was, in all cases, quoted considerably lower than the British factory cost without establishment charges.

Insurance Certificates for Employees.

For many years it was the custom of the People's Gas Company, of Chicago, to distribute turkeys at Christmas among all employees who had been in their service for a specified time; but last month, by vote of the employees themselves, those who had the required length of service received instead a certificate of life insurance, as an expression of the Company's appreciation of continuous and faithful service. The amount of insurance represented by each certificate was in accordance with the following schedule: For continuous service for not less than one year, $500; for one year, but less than two years, $600; for two years, but less than three years, $700; for three years, but less than four years, $800; for four years, but less than five years, $1000; for five years, but less than six years, $1200; and for six years and over, $1500. There was no physical examination required for this insurance. The fact that a man was then employed was taken to be sufficient evidence that he was in good health. If an employee desired to increase the amount of the insurance up to $5000, he might, by submitting to a physical examination, do so at the same proportionate rate as was paid by the Gas Company under the "group" plan, which would be considerably less than the regular rates.

The next meeting of the Eastern Section of the Southern Association of Gas Engineers and Managers will be held at No. 28, Grosvenor Gardens, Westminster, in the rooms of the Institution of Gas Engineers, on Wednesday, the 25th inst., at 2.30.

NATIONAL GAS COUNCIL.

Meeting of the Central Executive Board.

A MEETING of the Central Executive Board of the National Gas Council was held on the 10th inst., at No. 30, Grosvenor Gardens, S.W. 1. Pending the election of a Chairman, Alderman PHILLIPS was voted to the Chair.

ELECTION OF CHAIRMAN AND VICE-CHAIRMEN.

Mr. D. Milne Watson, the retiring Chairman, was unanimously re-elected to the office. Alderman Phillips, the retiring Vice-Chairman, consented to accept re-election; and Mr. Wm. Cash, F.C.A., and Mr. J. H. Ellis were also elected Vice-Chairmen.

BILL PROMOTED BY AN ELECTRIC POWER COMPANY.

The attention of the meeting was drawn to a Bill being promoted by an Electrical Power Distribution Company containing a provision which would enable local authorities to invest money in such Power Company. It was pointed out that this would be a very undesirable proceeding in the interests of the ratepayers, and certainly unfair to gas companies; and it was agreed to lend the Council's support to those who were opposing the clause.

Other legal questions affecting the industry as a whole were considered, and decisions come to as to the appropriate steps which were to be taken in each case.

SPENT OXIDE.

The further steps which are being taken in this matter were reported; and it was agreed that the subject should be placed on the *agenda* for consideration at the next meeting of the Central Executive Board.

APPOINTMENT OF GAS EXAMINERS UNDER THE GAS REGULATION ACT, 1920.

Counsel's opinion on the words "a competent and impartial person" appearing in the Act was carefully considered, together with the views of the various Districts upon the appointment of Gas Examiners. In view of the importance of the question, it was resolved that a small committee should be appointed, with a view to making representations to the Gas Referees and taking such other steps as may seem to them desirable.

RAILWAY RATES.

It was reported that the recent concessions with regard to railway rates on the carriage of coal, coke, &c., were disappointing, inasmuch as they were of no assistance to a very large number of undertakings, and of but little help to the remainder. It was agreed to co-operate with the Mining Association for the purpose of obtaining further concessions.

CORPORATION PROFITS TAX.

It was reported that a letter had been received from an Association of Public Utility Undertakings asking for the co-operation of the Council in retaining exemption from this tax. The principle of co-operation was agreed to; and it was left to the executive officers to take such steps in this direction as they thought fit.

SAFEGUARDING OF INDUSTRIES ACT.

(1) *Gas-Mantles.*—The Referee's decision in regard to this matter was reported and explained. The amount of duty leviable rests with the Customs officials. It was stated that further proceedings might be inevitable; and the Council was authorized to take such further measures as were necessary in this connection.

(2) *Domestic, Illuminating, and Mounting Glassware.*—On the motion of Mr. Charles Wood (Bradford Corporation), seconded by Mr. C. F. Botley (Hastings Gas Company), it was resolved that the Central Executive Board re-affirm the views expressed at the two meetings of the Board held in 1921, to the effect that the free import of glassware used by gas undertakings is essential to the gas industry. Mr. Ogilvie was instructed to inform the Committee (appointed under the Act to deal with the matter) of this decision.

FINANCE COMMITTEE.

The decisions arrived-at at a meeting of the Finance Committee of the Joint Bodies on the 13th December were reported.

BENZOLE.

It was stated that certain gas undertakings had reverted to the practice of recovering benzole from the gas; and those members who had the necessary plant installed were recommended to consider whether benzole could, under present conditions, be profitably extracted by them.

PRESS ARTICLES.

Reference was made to the misleading and ill-informed articles appearing in the Daily Press with regard to the supply of gas. The action taken by the Council was heartily endorsed.

Gas-Engines in a Fire-Station.—In the Fairhill emergency high-pressure fire-station, at Philadelphia, there have now been installed ten 300-H.P. gas-engines. On the alarm being given, the first cylinder of the engines is started by compressed air. They are gas-driven within five seconds. The pumps actuated by them produce 200 lbs. pressure over 38 miles of fire mains. Each engine consumes 75 c.ft. of gas per minute.

INSTITUTION OF GAS ENGINEERS.

Council Meeting.

A MEETING of the Council was held at No. 28, Grosvenor Gardens, Westminster, on Monday, Jan. 9, Mr. THOMAS HARDIE (the President) in the chair.

After the usual preliminary business, letters warmly acknowledging their election as honorary members of the Institution were reported from the respective Presidents of the Société Technique de l'Industrie du Gaz en France, the American Association, and the Associazione Italiana delle Industrie Gas ed Acqua.

EDUCATIONAL.

Progress of the scheme for the better education of gas engineers was reported. It was stated that further conference with representatives of the Board of Education will be arranged as soon as possible, after which it is hoped that the Committee having the matter in hand will be able to submit a revised draft scheme to the Council.

The thanks of the Board of Education were received for the loan of two models of the inclined vertical retort installation at the Erdberg Gas-Works, Vienna, for exhibition in the Science Museum, South Kensington.

WALES AND MONMOUTHSHIRE INSTITUTION REPRESENTATIVE.

The Wales and Monmouthshire District Institution of Gas Engineers and Managers notified the election of Mr. James Robb, of Chepstow, as their next representative on the Council of the Institution.

REFRACTORY MATERIALS RESEARCH.

Correspondence was read which has passed between the Refractory Materials Joint Committee of the Institution and the Society of British Gas Industries and the British Refractories Research Association, with reference to the question of continuing the Committee's work, which was commenced some years ago, and taken over by the Association. It appeared that, owing to lack of sufficient financial support, there was some danger of the work of the British Refractories Research Association being discontinued.

FUEL ECONOMY.

A statement was read from Mr. D. H. Helps, the Institution's representative on the British Association Fuel Economy Committee, and the Fourth Report of that Committee, which accompanied it, was presented. Prof. W. A. Bone, the Chairman of the Committee, criticized the report of the Board of Trade's Carbon Monoxide Committee.

The question of the appointment of a representative of the Fuel Economy Committee on the Smoke Abatement Committee was discussed, and Prof. Bone was appointed by them. The subject of low-temperature carbonization had been considered.

OBITUARY.

The deaths of M. Albert Ellissen, of Paris, and Mr. Thomas Duxbury, of Manchester (Honorary Members); of Mr. William Thomson (Member), of Ramsgate; and Mr. John C. Viggars (Student), of Wrexham were reported. The Council expressed their sympathy with those bereaved, and their sense of the loss sustained by the Institution.

CANDIDATES FOR MEMBERSHIP.

The following were approved as candidates for the next ballot:

For the class of Member: Mr. Thomas Henry Beaumont, of Horley; Mr. William Arthur Cartlidge, of Congleton; Mr. Robert John Hinton Clark, of Plymouth; Mr. John Ernest Lister Cooper, of Yeadon; Mr. Herbert Duxbury, of Llandudno; Mr. Clarence Leslie Godwin, of Woodbridge; Mr. John Beardsmore-Hyde, of Hawkhurst; Mr. Charles Rawson Longbotham, of St. Albans; Mr. Urban Orlando Scotchburn Nairne, of Wandsworth; Mr. Robert Needham, of Ramsey (I. of M.); Mr. Percy Parrish, of the South Metropolitan Gas Company; Mr. Fred. Peel, of Tyldesley; Mr. Henry Thomas William Pilbeam, of Santos, Brazil; Mr. Frank Porteous, of Ware; Mr. Charles Francis Wentworth Rendle, of Redditch; Mr. James Robb, of Chepstow; Mr. Arthur Reginald Wilfred Roberts, of Hereford; Mr. Frank Calvert Robinson, of Hull; Mr. George Robinson, of Pinner; Mr. Patrick Joseph Rooney, of Strabane; Mr. Melville Russell, of Elstree; and Mr. Wm. Howard Wise, of Droitwich.

For the class of Associate Member: Mr. Arthur Edward Bullen, of Plymouth; Mr. Charles John Dickenson Gair, of Vauxhall (South Metropolitan Gas Company); Mr. A. Hayter, of Hornsey; Mr. James Denham Hester, of Ventnor; Mr. Henry George Horwood, of Rhymney; Mr. Leslie Pool Ingram, of Plymouth; Mr. David Thomas Livesey, junr., of Stretford; Mr. Duncan Mackenzie MacDonald, of Bromley (Gas Light and Coke Company); Mr. Frederick John Symons, of Pontypool; Mr. Francis Herbert Vince, of Newcastle-upon-Tyne; Mr. Herbert Courtenay Widlake, of Plymouth; Mr. Sigurd Albert Walfrid Wikner, of Newcastle-upon-Tyne; Mr. Arthur Wells, of Milton Regis; Mr. Thomas Biddulph-Smith, of Stocksbridge.

It was agreed that Mr. H. H. Kinnear, of Swindon, and Mr. Thomas Sharratt Godwin, of Watford, be transferred from the class of Associate Member to that of Member, and that the following be admitted as Students: Mr. L. W. Boulter, of Wanstead; Mr. Oswald P. Cronshaw, of Great Harwood; Mr. Harold Jack, of Southport; Mr. James F. Levisohn, of Leeds; Mr. John A. Rose, of Wapping; Mr. Ernest Sainsbury, of Birmingham; Mr. Eric B. Shaw, of Stoke-on-Trent; Mr. William John Shelley, of Walsall; Mr. William Henry Watkins, of Lower Sydenham.

TESTING GAS-COOKERS.

Steps were reported which had been taken in response to a communication from the National Gas Council requesting the Institution to consider proposals made by a Committee of the Council for a standard method of testing gas-cookers with a view to standardizing them for use throughout the industry. The matter had been referred to the Research Sub-Committee of the Institution's Gas Investigation Committee.

LIFE OF GAS-METERS.

The Life of Gas-Meters Committee presented a statement indicating the work which had recently been carried out. Arrangements were approved for the issue of a letter of inquiry to gas undertakings on the subject of the maintenance of automatic meters. The report of the Chemist, Mr. J. G. Taplay, on his process for the extraction of hydrocyanic acid was read. It was stated that the process was now being tried on a large scale; and it is hoped to publish results when they are ready.

FACTORY LIGHTING.

The Committee of the Council to whom had been referred for consideration certain points as to "glare" in the second report of the Home Office on Lighting in Factories and Workshops, reported the progress they had made in the matter.

GAS INVESTIGATION COMMITTEE.

It was reported that a meeting of the Gas Investigation Committee had been held at Birmingham, in connection with which visits had been paid to the Central Laboratory of the Corporation's Gas-Works at Nechells, and to their Adderley Street Gas-Works. At the former were shown the facilities for collecting, storing, and mixing gases of different qualities and calorific value. The recorders and charts therefrom, forming the subject of the Committee's Report on Calorimeters, were inspected. The work now in hand consists of aëration tests, including tests of actual ring-burners taken from gas-cookers. At Adderley Street, experiments on blue water gas manufacture were being made with the object of determining the effect of changes in depth of fuel bed, in rates of flow of air and steam, and in the ratio of the amounts of air and steam.

Arrangements had been made for carrying out tests on the carburetted water gas sets with waste-heat boilers at the Windsor Street Works of the Birmingham Corporation Gas Department.

BRITISH EMPIRE EXHIBITION.

The Institution have been requested to appoint representatives to assist in organizing the gas exhibits of the British Empire Exhibition (1923). Messrs. Samuel Glover, F. W. Goodenough, A. A. Johnston, and Albert Stokes had been nominated.

PUBLIC WORKS, ROADS, AND TRANSPORT CONGRESS.

A report was given of the day's proceedings which had been arranged by the Institution in connection with the Public Works, Roads, and Transport Congress. The following papers had been presented and discussed: "Public Lighting by Gas," by Dr. J. S. G. Thomas and Mr. Dean Chandler; "The Utility of Benzole for Transport Purposes," by Capt. E. de Normanville; "Tar for Public Roads," by Mr. Hugh James; and "The Reduction of Atmospheric Pollution arising from the Use of Gaseous Fuel," by Dr. J. S. Owens.

ACCOUNTS.

The report of the Finance Committee, including accounts for the year ended Dec. 31, 1921, was presented, and adopted.

PROPOSED "ADOPTION" OF LOOS.

The movement inaugurated by the British Section of the Société des Ingenieurs Civils de France, for the restoration of the mining and manufacturing town of Loos, near Lens, was reported upon; the Institution having been invited, with other representative British engineering institutions, to assist in the scheme for the "adoption" of the town, if possible. The President (Mr. Hardie) and the Hon. Secretary (Mr. W. E. Price) were nominated to represent the Institution in discussing the matter.

THE POSTPONED VISIT OF MEMBERS OF THE FRENCH SOCIETY.

The postponed visit of the President and members of the Société Technique de l'Industrie du Gaz en France as guests of the Institution, was referred to; and consideration was given to the preliminary arrangements.

The annual general meeting of the Iron and Steel Institute will take place on Thursday and Friday, May 4 and 5, at the Institution of Civil Engineers, Great George Street, S.W.; and in the evening of the first-named day there will be a dinner in the Connaught Rooms, Great Queen Street, W.C. In March the Council are prepared to consider applications for grants from the Carnegie Fund, in aid of research work, of such value as may appear expedient. The research work must be on some subject of practical importance relating to the metallurgy of iron and steel, or allied subjects; and the results of the work must be communicated to the Institute in the form of a report.

GAS BILLS FOR 1922.

[SECOND ARTICLE.]

WE continue, and complete, to-day a review of the Gas Bills promoted for the ensuing session of Parliament. It is a long time since the survey of the proposals for a session's gas legislation could be published in two issues. The responsibility lies with the Gas Regulation Act; and most people regard this as fortunate.

Our "Parliamentary Intelligence" last week announced that the CHESTER GAS COMPANY are applying to Parliament for authorization to substitute for their present powers of charge and dividend a basic price and basic dividend. The Bill, however, will not be ready for notice for some weeks.

The SHEFFIELD GAS COMPANY are promoting a Bill to make provision regarding prices and the application of profits, as well as (*inter alia*) to increase their borrowing powers. Regarding the latter matter, the existing paid-up share capital consists of £270,000 of "A" stock, £419,968 of "B" stock, and £1,047,000 of "C" stock. The Company also received authority by their 1917 Act to raise, but have not yet done so, a further £600,000 by the creation and issue of new ordinary or preference shares or stock. In addition, they were empowered to borrow on mortgage or raise by the issue of debenture stock (1) the sum of £580,000 in respect of the existing "A," "B," and "C" stocks, the whole of which has been raised by the issue of debenture stock or by mortgages; and (2) a sum equal to one-third part of the amount which at the time of borrowing has been raised of the further capital of £600,000. Regarding the charges for gas, the maximum price is 1s. 1·6d. per therm. The dividends payable on the "A," "B," and "C" stocks are limited to 5 p.ct. per annum, subject to reductions in the case of the "B" and "C" stocks, and on any ordinary shares or stock forming part of the further capital of £600,000, if the general charge for gas exceeds 1s. 0·4d. and 10·6d. respectively per therm. It is submitted in the preamble (as it has been in other measures, such as that of the South Metropolitan Gas Company of 1920) that it is expedient provision should be made for entitling the employees and shareholders to derive benefit from the efficiency and economical working of the undertaking; and later in the Bill provision is made to ensure that they shall do so. Turning to the clauses, the first to be noted is one which proposes to enact that the provisions of the Gas-Works Clauses Act, 1847, with respect to the amount of profit to be received by the undertakers, are to cease to apply. Then it is proposed that the basic price of gas shall be 9d. per therm; but this price, it is suggested, may at any time after 1926 be revised by an Order made by the Board of Trade under the Gas Regulation Act, in the like circumstances, on the like conditions, and in the like manner as the price could be revised if it had been originally authorized by an Order made under that section. It is suggested that the basic rate of dividends on the ordinary capital shall be: (1) In the case of the existing "A," "B," and "C" stocks, the rate of 5 p.ct. per annum; (2) in the case of any ordinary shares or stock issued after the passing of the measure, such a rate per cent. (not exceeding, except with the consent of the Board of Trade, 7 p.ct. per annum) as may be authorized by the resolution creating the shares or stock. The succeeding clause deals with the division of surplus profits when the price of gas is less than the basic price. These clauses are in the form of those in the South Metropolitan Gas Act of 1920, and provide that a sum not exceeding one-third of the consumer's benefit (derived from supplying the gas at a charge below the basic price) is to be applied in two equal parts for the benefit of the holders of ordinary capital and for the benefit of the employees. The sum available for the benefit of the holders of ordinary capital may be applied to the increase of dividends above the basic rates, and if and so far as not so applied is to be carried to the reserve fund. The sum available for the benefit of the employees is to be carried, in such proportions as the Directors from time to time deem proper, to the superannuation fund and to a fund to be formed in connection with any profit-sharing scheme which may be established under the Act, or wholly to the last-mentioned fund. The moneys (if any) so carried to any fund formed in connection with the profit-sharing scheme is to be credited to the employees participating in the scheme as a uniform percentage of bonus on the total salaries and wages of those employees during the year or half year to which the moneys relate. There is provision attached that (1) the Directors may, in their discretion, determine that the sum so to be applied for the benefit of the employees, or some part of the sum, shall be distributed among all the employees who were in the employ of the Company at any time during the year or half year to which the sum relates, and (2) if prior to the establishment of a profit-sharing scheme, any part of the sum so to be applied is carried to the superannuation fund a fair proportion shall be distributed among those of the employees who are not contributing members of that fund. Any such distribution shall be made in the form of a bonus representing a uniform percentage on the salaries or wages of the employees during the year or half year. There is provision for a reserve fund. The Company are proposing to limit their carry-forward after the present year in this wise: At the end of any year, it shall not be lawful for them to carry forward to the credit of the reserve account any sum exceeding the total of the following amounts: (*a*) The sum required to pay any dividend or interest which the Company are entitled or required to pay, but have not paid, in respect of that year; (*b*) the amount which will be required for paying one year's dividend on the preference capital (if any) and one year's dividend at the basic rates on the ordinary capital; and (*c*) the amount which will be required during the next following year for paying interest on any loan capital. A special purposes fund appears, as well as one for the establishment of a benefit fund, and provision for the granting of pensions, &c. Profit-sharing clauses are also included. A subsequent clause refers to an increase of borrowing powers in respect of existing and additional capital. It is proposed that section 12 (Power to Borrow in Respect of Existing and Additional Capital) of the Act of 1917 shall have effect as if (*a*) "£850,000" was substituted at the end of sub-section 1 of that section for £580,000; and (*b*) the words "one-half" were substituted in sub-section 2 of that section for the words "one-third part." Finally, the Directors' remuneration is dealt with. It is provided that no nominee Director shall be entitled to receive any remuneration; and the total remuneration to be paid to all the elected Directors (exclusive of any remuneration paid to any managing director) shall not in any year exceed £4000. [*Parliamentary Agents: Messrs. Rees and Freres.*]

The STOKE-ON-TRENT CORPORATION are by the next Bill proposing to give effect to the long-time desire to purchase the Potteries undertaking of the British Gas Light Company, and to amalgamate it with their existing undertakings—Longton, Stoke-on-Trent, Fenton, and Burslem. By the Stoke-on-Trent Extension Order, 1921 (which will come into effect on April 1 next), the boundary of the borough was extended, and changes were made in the areas of local government adjacent thereto. It is therefore submitted in the preamble to the Bill that it would be of local and public advantage if the Corporation were empowered to acquire the Potteries undertaking. Further, by virtue of the Stone Gas and Electricity Acts, 1881 and 1914, the Stone Gas Light and Coke Company, Ltd., are authorized to supply, but do not supply, gas within that portion of the parish of Stone Rural which is within the limits of supply; and therefore it is expedient that the powers of the Company to distribute gas in that area should be repealed. There are in the Bill clauses to repeal certain enactments, with specified reservations. Also one to abrogate the powers of the Stone Company in the area already referred to. As to the transfer of the Potteries station of the British Gas Light Company, it is proposed that this shall take place as from Dec. 31, 1920, and, subject to the debentures, for the following consideration: (*a*) The payment by the Corporation to the Company of £100,000 in cash; and (*b*) the issue by the Corporation to the Company, or to such persons as the Company shall direct in writing (at least fourteen days before the day of transfer), of stock created by the present measure. Provisions are included as to the maintenance of the undertaking, and the transfer and vesting of it in the Corporation. As to the debentures and the interest accrued and accruing thereon at and after the day of transfer, these, it is proposed, shall continue to be a charge on the Potteries undertaking in the hands of the Corporation to the same extent and with the same incidents as at present. By agreement with the holders of any of the debentures, the Corporation may at any time substitute for the security any stock, mortgage, or other security of the Corporation, or pay off the amount secured by the debenture or debentures, and redeem the security with moneys raised under the powers of this measure. Provision is made for the keeping by the Company of accounts up to the date of transfer; and within one month after the receipt by the Corporation of the audited accounts, the Corporation are to pay the Company in cash (*a*) the amount shown to have been expended on capital account between Dec. 31, 1920, and the day of transfer, and (*b*) such sums as when added to the net receipts shown by the accounts to have been received by the Company between Dec. 31, 1920, and the day of transfer will enable the Company to pay the dividends authorized to be paid during the period in respect of the ordinary capital raised and expended on the Potteries undertaking up to the day of transfer, less the amount of the dividends paid after Dec. 31, 1920; and (*c*) the reasonable costs (legal and parliamentary) incidental to the transfer of the undertaking, including the costs of the Company in approving and appearing in support of the Bill—such costs to be taxed if so required by the Corporation. Compensation is to be paid by the Corporation to any officer or servant (other than Directors, solicitors, or auditors) in the regular employ of the Company who shall not be retained, provided that Mr. Cecil Rhodes Armitage, the local Resident Engineer, shall be entitled to retire on, or on giving one month's notice in writing to the Corporation at any time after, the transfer of the Potteries undertaking to the Corporation, and in that event to receive compensation in like manner as if he were an officer who had not been retained by the Corporation. The maintenance, continuing, and linking up of the various works are provided for, subject to the Corporation maintaining and continuing the manufacture of gas at the Company's works at Etruria in the borough so long as any of the debentures are subsisting. New limits of supply are defined. To the maintenance of works clause, the one-third restriction to the purchase of secondary products is appended. Land purchase powers are included; and then follow a number of ordinary clauses. There are several transitory provisions respecting quality, testing, pressure, and price of gas; but these need not be noticed, as they will cease to have force as soon as an Order is made under

section 1 of the Gas Regulation Act. With respect, however, to the Potteries undertaking, the gas is to be of a calorific power of 470 B.Th.U., as tested under the Gas Regulation Act, with a price not exceeding 13d. per therm. As to finance, on the passing of the Act, the creation is contemplated of £245,000 of stock, to be called Stoke-on-Trent gas 1937-1962 redeemable 6 p.ct. stock. The stock is to be redeemable at par on Sept. 29, 1962, or at the option of the Corporation by six months' notice in writing to the Company to expire on, or on any day after, Sept. 29, 1937. In the meantime, such stock, and all interest accrued or to accrue thereon, is to be charged on the revenue of the gas undertaking and the district fund and general district rate. The Corporation propose to borrow £100,000 for the portion of the purchase consideration payable to the Company in cash, repayable in forty years from the date of borrowing; the sums requisite for meeting any money payable by the Corporation to the Company or to any of their officers or servants, and defraying the costs incidental to the transfer, the money to be repayable in forty years; and the amount necessary for paying the expenses of the present measure, repayable in five years. Authority is sought to borrow further sums by the sanction of the Minister of Health. A clause prescribes how the revenue is to be applied; and it concludes:

> Any balance remaining in any year of the income of the gas undertaking (including the interest on the reserve fund when such fund amounts to one-fifth of the said aggregate capital expenditure) shall, after making reasonable provision for working capital, be carried forward to the revenue account of the gas undertaking for the next succeeding year, and shall be applicable to the reduction of the price of gas supplied within the borough from such undertaking.
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> Any deficiency in the revenues or receipts of the Corporation on account of the gas undertaking in any year shall be made good in the first instance out of the reserve fund (if any) in connection with such undertaking; and if there be no such reserve fund, or if such reserve fund shall be insufficient for the purpose, then out of the district fund; but in that case any deficiency shall be a debt due from, and shall be repaid to the district fund out of, any future revenue of the gas undertaking.

A number of miscellaneous clauses follow. [*Parliamentary Agents: Messrs. Torr, Durnford, & Co.*]

The Bill of the STRETFORD AND DISTRICT GAS BOARD is designed to constitute a Joint Board, consisting of representatives of the District Councils of Stretford, Urmston, Ashton-upon-Mersey, and Sale, and the Rural District Councils of Barton-upon-Irwell and Bucklow, and to authorize the Board to acquire from the Manchester Corporation the undertaking lately belonging to the Stretford Gas Company. The Corporation were only empowered to purchase the undertaking last session; but a clause was included in the Act providing that if the local authorities named, or any two or more of them, introduced a Bill in the next session, and *bonâ fide* promoted it, to constitute a Joint Board to purchase from the Corporation the undertaking, for the consideration mentioned in the section, the Corporation should not directly or indirectly oppose such Bill, save to secure the insertion of provisions to protect their interests. The same applies to the distribution appliances in the township of Davyhulme, which the Corporation bought from Salford for £7000. This it was agreed should form part of the undertaking of the Company, and should be deemed to be a debt or obligation to be paid and discharged by the Board. The Board also seek the repeal of the gas powers of the Altrincham Gas Company in the urban district of Ashton-upon-Mersey (except to certain houses and public lamps in the Washway Road) and in the north-western portion of the parish of Baguley. Glancing at the clauses of the Bill, it is seen that first the incorporation of the Board is provided for. The constitution it is proposed shall be eight members from Stretford, three from Sale, two from Ashton-upon-Mersey, two from Urmston, two from Barton-upon-Irwell, and one from Bucklow. Several pages of the Bill are taken up with provisions relating to the powers and duties of the Board. Then follow the clauses as to the sale of the undertaking by the Corporation to the Board—the consideration being that the Board shall pay to the Corporation all sums paid or payable to the Company or their officials or employees under, or in pursuance of, the agreement, the debenture obligations are to be taken over, as well as the discharging of all debts to which the Corporation are liable, the payment of the £7000 to Salford, and any money expended by the Corporation in additions or improvements to the undertaking. But the Corporation are not to be entitled to be repaid any sum expended in effecting such additions or improvements if the cost exceeds £100, unless the Councils concerned shall have consented to the making of such additions or improvements. The sale it is proposed shall take effect from Dec. 24, 1921; and the Board are to be entitled to the money received from the carrying on of the undertaking from that date until the completion of the sale. The Corporation on their part are to be reimbursed all money expended by them in connection with the carrying on of the undertaking. The sale and purchase are to be completed on Sept. 29, 1922. Later it is provided that if Henry Kendrick, Joseph Hall, David T. Livesey, E. Nicholson, Thomas Emmett, and R. H. Moss, who were respectively at the passing of the Act of 1921 in the employ of the Company, shall, at the date of the completion of the sale of the undertaking, still be in the employ of the Corporation, any of them shall be entitled to decline to enter the service of the Board, or to resign therefrom within twelve months, and, in either of those events, to receive compensation as if he or they had been dismissed within twelve months after the transfer of the undertaking. The limits of supply are defined, the testing for calorific power (450 B.Th.U.) is provided for, a minimum pressure of 2 in. is stipulated, and the maximum price of gas is put at 5s. per 1000 c.ft. provided that, within twelve months from the passing of the Act, the Board are to apply to the Board of Trade for an Order under section 1 of the Gas Regulation Act. A large number of ordinary clauses are included; among them the new one as to the provision of a valve where high-pressure air is used. In respect of finance, the Board ask for power to borrow (*a*) all sums required for the purchase, the redemption of debenture stock, and for paying compensation to the officials (repayment period thirty-five years); (*b*) £15,000 for the alteration and improvement of the works, and for new mains and extensions of mains (repayment period thirty years); (*c*) £10,000 for working capital (repayment period ten years); and (*d*) for the costs of the Act, the requisite sum (repayment period five years). [*Parliamentary Agents: Messrs. Lees & Co.*]

The WINDSOR ROYAL GAS COMPANY are promoting a Bill for empowering them to sell gas on the heat-unit basis, to confer further financial powers, and to extend the limits of supply. In the preamble of the Bill, it is seen that the issued capital consists of £9600 preference shares entitled to a maximum dividend of 5 p.ct. per annum, £24,000 original shares entitled to a maximum dividend of 10 p.ct. per annum, and £36,400 new shares entitled to a maximum dividend of 7 p.ct. per annum. The whole of this capital has been issued, and is fully paid-up. The Company were authorized to borrow in respect of the original capital £6000, and in respect of the new shares £9100, the whole of which still remains to be borrowed. The maximum price authorized to be charged for gas is 5s. 6d. per 1000 c.ft. within the borough of New Windsor, and 7s. per 1000 c.ft. beyond the limits. First noticed are the clauses as to the heat-unit basis of charging. The Company propose that, within three months from the passing of the Bill, they shall give notice of the calorific value of the gas they intend to supply, as well as the date from which they will commence a supply which must not be more than three months from the date of the notice. All the general provisions of the Gas Regulation Act are to apply to the Company; and, in regard to pressure, the addition is included which the Board of Trade made to the pressure regulations when the declared calorific value is less than 350 B.Th.U. Up to that point the minimum will be 2 in. When below it, and when not under 300 B.Th.U., the minimum pressure is to be 2½ in. When the declared calorific value is below 300 B.Th.U., the minimum permissible pressure is to be such (not being less than 3 in.) as shall be prescribed by the Gas Referees. The Company are adopting the South Metropolitan plan in regard to prices and application of profits. It is proposed that the basic price of gas supplied to ordinary consumers shall be within the limits of the borough of New Windsor 16d., and beyond those limits 19d. per therm. It is provided that the Company shall not in any one year declare any larger dividend on the original shares of the Company than at the rate of 10 p.ct., on the new shares at the rate of 7 p.ct., and at the same rate on the additional ordinary capital issued after the passing of the present measure. Power is taken to make up any future arrears of dividends; and then we come to the clause providing for participation in benefits resulting from good working. This clause entitles the ordinary shareholders and the employee co-partners to share in the profits when the charge for gas is below the basic price. They will be entitled to receive, in such proportions as the Directors may decide (being not less than one-half to the employee co-partners), a sum equal in the whole to one-third of the total sum by which the consumers have benefited in any year or half year by way of a reduction in the price of gas supplied to them below the basic price. As to the additional capital the Company desire authority to issue £30,000, as well as borrowing powers equal to one-half of the paid-up capital of the concern. Debenture stock and redeemable preference or debenture stock provisions appear, as well as authorization to create reserve, special purposes, and renewal funds. It is proposed that the renewal fund shall be built-up (if the Directors think fit) by annual appropriations out of revenue of any sum not exceeding an amount equal to 1 p.ct. on the paid-up capital for the time being. The limits of supply are to be extended; and the land authorization is to be enlarged. For a piece of land belonging to the Company, manufacturing powers are now sought. Several clauses giving ordinary modern powers are embraced in the Bill, including one providing for the holding of annual meetings. It is also noticed that the Company are seeking the repeal of section 46 of the Act of 1867, as to charges for public lamps in the borough of Windsor. It is proposed that the charge shall now be such as may be agreed upon between the Company and the Corporation. The new clause as to the provision of a valve where high-pressure air is used also appears. [*Parliamentary Agents: Messrs. R. W. Cooper and Sons.*]

Coke-Stoves for the House of Commons.—The Nautilus Company, which is associated with the Davis Gas-Stove Company, are meeting with good success with the Danish coke-stoves referred to by Mr. F. D. Marshall in an article on another page. It is understood that some of these stoves are to be fitted in the House of Commons.

COAL AND BYE-PRODUCTS ANALYSIS.*

In a foreword to this book Sir Robert Robertson, K.B.E., F.R.S., remarks on the immense importance to Britain, as an industrial nation, of the proper utilization of the coal which is our chief available source of energy. He laments the wasteful way in which it has hitherto been so generally consumed; but notes an awakening consciousness of the need for instituting saner methods. An indication of this desire to know more of the inherent potentialities of coal, in order to promote economy in its use, is seen in the fact that, within a period of less than two months, we are called upon to review two books on coal analysis.

In the present one, the subject of the evaluation of coal and its products is treated both exhaustively and critically. The authors have endeavoured to provide a sound basis on which to found standard methods of examination and analysis that may facilitate the fullest utilization of coal in its industrial applications and provide reliable guidance in commercial transactions. That they have succeeded in their aim to a very large extent, we verily believe. Apart from one or two minor matters, which will be mentioned in their place, there is very little in the book that we can take exception to. As a whole, we consider, after very careful reading, it is the most thorough and reliable work on the subject which has yet appeared.

The book is divided into sixteen chapters—seven of which are devoted to coal itself, its analysis, and the determination of its value for different purposes—followed by five appendixes and some tables of useful memoranda. As regards coal, the authors are not interested only in the utilization of the mineral, but are concerned with the winning of it; and so we get the account of an experimental inquiry they have carried out into the origin of the ash of coal, and the extent to which this is due to the inclusion —through accident or the carelessness of the coal getter—of extraneous mineral matter.

We have noted the omission of any reference to arsenic as an occasional constituent of coal. Seeing that coke is still used as fuel in the process of malting, and remembering the scare of some years ago, when the presence of arsenic in beer led to the discovery of the impurity in some malting coke, we consider that, in the ultimate analysis of coal, the possibility of the presence of this undesirable ingredient should not be overlooked.

The chapters dealing with the assay of coal tar, and the various products resulting from its distillation, are among the most satisfying in the book. They ensure safe guidance to the chemist unfamiliar with this somewhat obscure branch of chemical analysis. It is rightly pointed out that the primary products of tar distillation, which are of economic importance, are in general complex mixtures. The just evaluation of them is dependent upon their conforming to certain tests, which are only serviceable if carried out under strictly defined conditions. To the exigencies of the late war was due the initiation of much research work into the conditions of such testings; and the authors have freely availed themselves of the results of the labours in this direction of Dr. H. Colman and other investigators.

For the analysis of ammoniacal liquor and the salts obtained from it, they have in general followed the directions contained in the annual reports of the Chief Inspector under the Alkali Works Regulation Acts. We note that, in the determination of acidity in ammonia salts, Mr. Illingworth prefers to titrate with decinormal ammonia instead of soda. In this, we believe him to be well advised; but his recommendation to employ cochineal instead of methyl orange as indicator, requires some modification. With solutions of pure ammonia salts cochineal is by far the best indicator; but, unfortunately, it is not equally serviceable when dealing with commercial sulphates. There appears to be some impurity present in most of the samples which the present reviewer has met with, preventing the development of the proper colour.

Spent oxide is not actually a product of coal; but it is recognized in this book as being a bye-product of one of the chief uses of coal. The usual procedure for determining its sulphur content, freed from tarry matter, is described; and there are some discriminating remarks on the recognition and estimation of the cyanogen compounds usually contained in it.

In the chapter on gas analysis, the reason why the examination of mine air is more fully and more satisfactorily treated than is the general subject of technical gas analysis may be that the authors are more closely connected with the mining industry than with that of gas supply. For the complete analysis of coal gas, the Bone and Wheeler apparatus and the Bunte burette are alone mentioned. The latter is a very valuable instrument; but we consider that it is being pressed into service for which it is not adapted when applied, according to the authors' directions, to the complete analysis of coal gas. No mention is made of the well-known apparatus of Hempel, which is inexpensive, simple, and, when properly used, very efficient. The truth is there are now so many really serviceable arrangements available that it may be said that that one is best which is best used—careful manipulation counting for more than elaboration of apparatus. On this matter of manipulation we note a peculiar discrepancy of the authors. On p. 268 is given the order in which the various constituents of coal gas are to be estimated by means of the Bone and Wheeler apparatus. On p. 270 is an example of carrying-out an actual analysis, in which the constituents are estimated in a quite different order!

A note of warning may be sounded with regard to the recommendation, on pp. 278 to 280, to take samples of flue gas through an iron tube let into the flue. In boiler furnace work, with comparatively low flue temperatures, such an arrangement may not be detrimental; but if the same were applied to the flues of a retort-setting, the accuracy of the analytical results would undoubtedly be seriously impaired.

In the chapter on calorimetry, the bomb calorimeter is rightly described at considerable length; it being admittedly the most perfect to use with solid fuels. But the Lewis Thompson apparatus, now quite discarded, is also described; while William Thomson's real improvement on the latter, which makes it a fairly serviceable instrument, is not mentioned. The references to gas calorimetry are quite up-to-date.

A useful chapter for industrial users of coal has the heading "The Control of Combustion." It shows how heat losses by way of the chimney can be avoided, and economy of fuel promoted, through the systematic carrying-out of analytical examinations of flue gases and ash.

The two concluding chapters deal with the action of solvents on the coal substance and with viscosity and flash-point determination respectively. The former is an entirely modern method of investigating coal, which may, it is hoped, in time throw some light on the constitution of the mineral. In any case the method is likely to be of increasing utility and importance as experience accumulates.

On parting from the book we would again express our appreciation of it as a welcome addition to the technical chemists' library. We have observed a few errors or misprints, of which 250° C. for 25° C., on p. 146, may be mentioned as the most flagrant example.

* "The Analysis of Coal and its Bye-Products." By S. Roy Illingworth, M.Sc., &c., assisted by Jenkyn Griffiths, F.C.S. London: The Colliery Guardian Co., Ltd. Price 21s. net.

COKE-OVEN GAS FOR ST. LOUIS.

Under a five years' contract, the St. Louis Coke and Chemical Company lately commenced to supply gas from their bye-product coke-oven plant at Granite City (Ill.) to consumers in six communities served by the St. Clair County Gas and Electric Company, of East St. Louis. Almost simultaneously the large modern water-gas plant of the latter Company was closed down, and will be used in the future only as a stand-by. In an interesting account of the matter supplied by a correspondent to the "Gas Age-Record," it is mentioned that every preparation had been made for the change-over; and no appreciable trouble was experienced with consumers' appliances, owing to the fact that the specific gravities of the coke-oven and water gas were found to be practically identical.

The coke-oven installation consists of two batteries of forty Roberts horizontal ovens, so arranged that the number can be added to as needed. A very important point is the successful carbonization by the plant of Illinois coals, which are to be found in abundance within a short distance of Granite City. The charges originally carbonized in the ovens were of mixed coals; but the proportion of Illinois coals was gradually increased until it is said that a metallurgical coke is now being produced from nearly 100 p.ct. Illinois gas coal. The coke has a bright, lustrous appearance, and is very hard. The secret of the successful operation of the ovens is claimed to lie in their constant heat transfer. This is accomplished by a 48-in. oven-wall, containing less than one-third voids, as well as by maintaining a constant heating value of the producer gas. In the coking of coal in these ovens, it is the contention that the power of coal to absorb heat is greater than its conductive capacity. In other words, it is capable of absorbing heat faster than this heat can be supplied. In the light of this idea, therefore, the correspondent proceeds, a particle of coal adjacent to the oven-wall will so rapidly absorb heat until it is nearly coked, that it will prevent any appreciable heat from reaching the particle closer to the centre up to this time. Heat, then, approaches the centre practically as each successive particle approaches a coked condition. The contents of the oven, after the centre is thus reached, will be entirely coked, and ready for pushing. Any delay in pushing at this point would result in a rapid temperature rise. From this it might be assumed that temperatures (say) as high as 1700° Fahr. might be used, as long as the heat transfer is constant. This assumption, remarks the correspondent, being quite contrary to the theories of some well-known authorities on this subject, is very interesting. Both Eastern and Western coals have been dealt with very successfully in these ovens; the principal difference being in the time of coking. Western coals require about 25 hours, as compared with 22 hours for Eastern coals. Another important fact which affects the carbonization of Western coals is their high oxygen content, which tends to burn-up the resinous or binding materials in the coal.

By the supply of the gas to the St. Clair Company, and the consequent closing-down of their water-gas plant, about 3,000,000 gallons of gas oil and 12,000 tons of gas coal are being conserved annually.

There is to be a visit by the Eastern District Section of the Scottish Junior Gas Association, on Saturday next, to the works of Messrs. R. Laidlaw and Son in Simon Square, Edinburgh.

THE GRATE AND THE FUEL.

By F. D. MARSHALL.

IN a leading article in the "JOURNAL" for Jan. 4, two important points were raised as to whether we should await the coming of low-temperature coke which could be consumed in the existing domestic grate without alterations, or whether the modification of the existing grates to burn gas-coke is not the correct solution of the problem and the best in the interests of fuel conservation.

The writer's answer to these queries is "neither." We have some time yet to await the commercial advent of a really first-class transportable low-temperature coke, although it is within sight; while the modification of existing grates would cause a turmoil, upset, and expense with which no householder would willingly put up. The proper way is for the authorities and the householder to concentrate on the selection of types of well-known coke-burning appliances, and see how, with the least disturbance possible, they can be adapted to British needs, and so consume the coke that is actually with us. There are hundreds of thousands of most perfect coke-burning stoves in use all over the Continent of Europe; and it surely should not be difficult to find one which would suit the needs of potential coke consumers in the British Isles.

To construct a scientifically-designed coke-stove of such proportions as to fit into the recesses now occupied by coal-burning fire grates is really a very difficult matter. The writer speaks from experience; and to construct a standard-sized coke-stove to fit all the varying dimensions of the fire-place recesses is a still more difficult job. Should, however, someone be successful in overcoming this problem, it appears to the writer to be verging on stupidity to place a coke-stove in a recess. If it is a square type of stove, the area of three sides of the same would expend their radiated heat in heating up the cold brickwork of the recess; or should the stove be of a round or oval type, only a small arc of the circumference would be effective in transmitting radiated heat into the room. And, again, if the stoves were constructed, as the most perfect stoves now are, of the hot-air circulating type, the hot air would surely pass up the chimney, intensifying the loss of the convected hot currents from the stove itself.

No. Looking at the proposition from every angle, if the considerable heating efficiency and economy from a well-constructed coke-stove is to be realized, it must stand in the room in a detached position, and not be poked away in a recess such as presented by a brickwork fire place. It is not implied that the stove should be so far out in the room as to become an obstacle; but it is implied that it must be a detached unit, so that its full radiating and air-circulating effect may be properly realized. In such a manner the Continental stoves are always fixed.

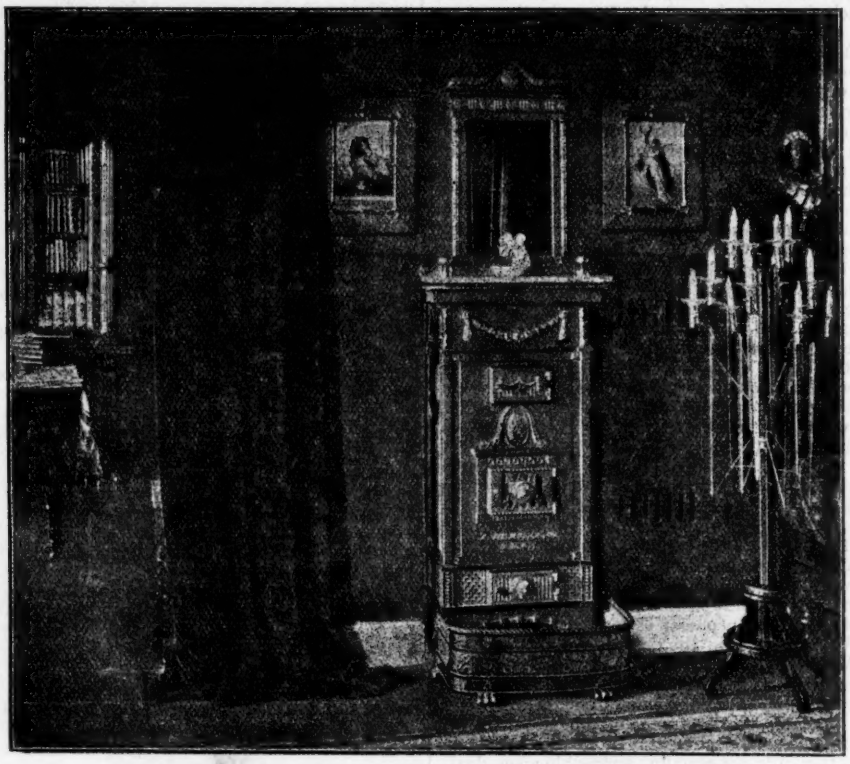
In a previous article,* the writer endeavoured to explain the construction of the excellent Danish stoves as typical of the latest designs of Continental coke-stoves. That they are not unsightly is evident from the accompanying photograph of a Danish dwelling room. This particular stove is some 3 in. or so from the wall; the flue being formed by a channel in the interior of the wall about 6 in. square. Such a type of stove, however, can stand on the hearth in front of an ordinary fire-place; all that is required being a short length of flue piping to enter the fire-place, with preferably an asbestos or sheet-iron plate closing the same through which the flue-pipe (which is quite out of sight at the back of the stove) passes. These stoves will burn wood, peat, lignite, coke, or very low-grade coals containing much ash, with equal facility; and in view of the fact that they will remain ignited for months on end, the labour question is immediately reduced to the vanishing-point.

The writer cannot close this communication without referring with gratitude to the painstaking work of Dr. Margaret Fishenden in comparing the radiant efficiencies of coke and coal; and we should all be further grateful if this lady would turn her attention to some little research on coke-consuming stoves.

One would imagine that the Fuel Research Board authorities would themselves long ago have devoted their attention to this pressing public matter; and the writer, in October, 1921, begged them to do so. The courteous reply was not quite what one might have expected, which, to quote the words of their letter to the writer, was:

> "We thank you for your offer to procure a sample of the Danish coke-stoves for investigation at H.M. Fuel Research Station. At the moment, however, the section of the Fuel Research Board which is responsible for research into domestic heating is in process of reorganization, and it is therefore impossible to avail ourselves of your suggestion, which, however, will be borne in mind should occasion arise."

Should occasion arise! This is delightful—as if the occasion had not arisen a long time past. But, seriously, is it not time that these Olympians descended from their majestic heights and started reorganizing themselves? Perhaps Sir Eric Geddes, with his little chopper, might expedite the reorganization.



* See "JOURNAL," Vol. CLV., pp. 593, 654.

Seasonal Consumers and a Service Charge.—The New Jersey Public Service Commission take the view that a service charge by a gas company is justifiable in order to eliminate discrimination among gas consumers where some of them use the service during only a small part of the year. They point out that each customer connected to the mains entails a fixed cost annually for the interest, taxes, depreciation, and maintenance of the individual service-pipe and meter devoted to such customer. If, for reasons of his own, the customer does not choose to use his service-pipe and meter for the entire twelve months, this does not relieve the company from the necessity of paying the fixed charges thereon. If they are not paid by the customer to whose sole use they are devoted, some other customer or customers must be charged with the cost.

A CONTRIBUTION TO THE HISTORY AND DEVELOPMENT OF THE BRITISH INTERNAL COMBUSTION ENGINE.

By JAMES ROBSON, of Messrs. Tangyes, Ltd., Birmingham.

[A Lecture delivered to the Midland Junior Gas Association, Jan. 12.]

In the history of great industrial inventions and progress, the names and the work of many of those pioneers who have had more or less to do in connection with such matters, have in varying degrees become publicly known; on the other hand, there are those, together with the early struggles in connection with the work upon which they have been engaged in their respective spheres, who have to a certain extent remained little known, owing perhaps to a natural desire on their part not to obtrude themselves before the eyes of the world. It is only right, however, that all those who have done so much in connection with the advancement of scientific research should be better known, and that the results of their labours should be written in the great history. The object of this contribution, therefore, is to place on record the work of my father, James Robson, and to show that he originated and made use of a number of the devices which are common to many of the internal-combustion engines of the present day. This record is compiled mainly from an outline account (which he committed to writing shortly before his death) of his early attempts in connection with the development of the gas-engine, and which have hitherto been little known outside the circle of his own personal friends.

James Robson was born at North Shields in the year 1833, on the banks of the River Tyne—the home of many famous inventors. His father was James Robson, a builder and contractor of North Shields.

The introduction of James Robson to the gas-engine came about in a somewhat singular, though perhaps natural, manner. When a young man of nineteen he went to London with his father and a party of friends to see the Great International Exhibition of 1851; and on his return to North Shields he conceived the idea of making an incubator similar to one he had seen at the exhibition. But instead of using an oil-lamp, he arranged to heat his apparatus by means of town's gas, a pipe being led from the dwelling-house for the purpose. After turning on the gas at the tap, which was situated a little distance away, he attempted to light it, when an explosion took place which forced-off the top of the incubator, owing to the gas having mixed with the air and produced an explosive mixture. The result of this innocent but somewhat dangerous experiment drew his attention to the possibility of utilizing the energy exerted by the explosion of a mixture of gas and air, and caused him to think of applying it to the working of small gas-engines. With this object in view, he sought for information as to the explosive force of coal gas; but all he could find was what he obtained from "Barlow and Babbage's Encyclopædia" of a "Report in 1814 to the Royal Society on the Danger of Gasometers in Towns." It was there stated by Dr. Wollaston, Dr. Ure, Dr. Young, and others, that a gasometer of 20,000 c.ft., if charged with an explosive mixture of nine parts of air and one of gas, would upon ignition produce the force of the explosion of four or five barrels of gunpowder. With this and such other meagre information as he could gather he carried out a series of experiments in a small cylinder made of double tin, 14 in. long and 3 in. diameter, the seams being folded and soldered. It was fitted with a stop tap at one end, and a piece of ¾-in. brass tube at the other end. The cylinder was then filled with ten parts of water, and the brass tube connected by means of an indiarubber tube to a gas jet. The cylinder being placed vertically, one-tenth of the water was run out through the tap at the lower end, its place being taken by the gas. The gas was then shut-off, and all the remaining water run out, its place being taken by air. A glass water-tube manometer was then attached, and the contents of the cylinder ignited by thrusting a small flame into it, care being taken not to allow any pressure to escape. This experiment was repeated many times, the maximum pressure obtained being 60 and 70 lbs. per sq. in.; and this pressure was reduced according as the composition of the gaseous mixture was varied, though he fully expected a pressure of 100 or more lbs. per sq. in., as being nearer the equivalent of the heat generated by the combustion of the gaseous charge. The duration of the explosion was also found to be much longer than several strokes of small steam-engines.

As showing the great interest James Robson in his early years took in the utilization of fuel for the economical production of motive power, it may be mentioned that he entered the competitive trials advertised in May, 1855, for the use of coal in connection with steam-boilers, which took place at Newcastle-on-Tyne. These trials were carried out at the instigation and expense of the Steam-Coal Collieries Association, Newcastle-on-Tyne, and a Report on them, signed by J. A. Longridge, W. C. Armstrong, and Thomas Richardson is published in a work on "Fuel and Combustion."* Out of 103 candidates who submitted proposals, only four were selected for trial, including James Robson; and although he did not succeed in getting the £500 premium, it was nevertheless a high position for him to attain, seeing that he had not then had any actual engineering training, having been apprenticed to the ironmongery and hardware business, and being only 22 years of age at the time of entry.

* Crosby Lockwood & Co., London, edited by C. W. Williams, Assoc. Inst.C.E.

HIS FIRST GAS-ENGINE.

James Robson (who at this time was the proprietor of an ironmongery and plumbing establishment in King Street, South Shields) then constructed in his spare time his first experimental gas-engine in the year 1857. It was known among his relatives as the "Cogwheel" gas-engine, because (being merely an experiment), a makeshift flywheel was used, consisting of a disused spur-wheel from an old quarry crane. It operated on what is known as the direct-explosive atmospheric principle, there being an explosion at every revolution of the crankshaft. The engine had a cylinder 3½ in. dia. by 6 in. stroke, and worked by direct explosion on the underside of the piston. The charges of gas and air were drawn into the cylinder for about one-third to one-half of the up-stroke, when the gaseous charge was ignited at atmospheric pressure by means of a pilot gas-jet; the inlet valve being closed by the rise in pressure after ignition, and the time of ignition being controlled by a cam on the crankshaft. The exhaust valve was operated on the return or down stroke of the piston by a bell-crank and rod from an eccentric also on the crankshaft. The working cylinder was cooled by being immersed in water in a wooden tank, and a board was floated on the top of the water to prevent it from splashing into the open end of the cylinder. This small engine was used merely for experimental purposes, and to obtain data therefrom, as he had in view the construction of a larger and more powerful gas-engine. After serving its purpose, it ultimately met with an untimely end, as its parts were scattered on his establishment being wrecked by falling into excavations made alongside when building the Theatre Royal at South Shields in 1865.

Robson spent a great deal of time in developing different systems of ignition. The first consisted of a 9-in. plate-glass electrical machine, encased in a baked wooden box, well varnished with shellac; the electric current being conveyed from the machine to the porcelain igniters on the engine by means of gutta-percha covered wires, which were rocked to and from the igniters by the engine to produce the spark. The glass plate was revolved by a strap from the engine, and was kept warm by the friction of the cushions. This system worked well. When not in use the machine was removed from the engine and kept in a warm, dry room. He also made use of an electric arc flame effected by the disruption of the current between metallic points in the engine cylinder, the current being generated by two Bunsen cells and passed through a primary coil of copper wire surrounding an iron core. This also worked well. But the attendant got muddled-up with the nitric and the sulphuric acids in the batteries. A Ruhmkorff tension coil was also successfully made use of; but the trouble with the acids required for the batteries still existed.

He then developed a gas ignition system consisting of a shielded gas-jet carried on a double-valve bolt thrust into the engine cylinder, which ignited the gaseous charge in it. This was easily managed and worked exceedingly well.

DEVELOPMENTS.

The next engine of James Robson was made in 1858-9, and was of the horizontal type, being an improvement on the vertical engine previously described. It was of 3 H.P. and drove an 18-in. circular saw in his father's building establishment at North Shields for about nine years, when the cylinder water jacket was burst by frost. Two other similar engines were built by him, one for driving the printing machinery at the offices of the "Shields Daily News," and the other—a 1 H.P.—for similar work at Messrs. Simpson and Mustard, printers, North Shields; so that all three engines were at work in the same town.

Below is given a copy of an interesting letter which the author received from the late George H. Haswell—a well-known Tynesider—who was himself a native of North Shields:

Hamstead Road, Handsworth,
Birmingham,
Oct. 7, 1909.

Dear Mr. Robson,—I am intensely interested in the account your father has written me on the early struggle for the internal-combustion engine, and having made a copy of it, return the original to you for safe keeping.

The engine at the building yard I remember perfectly, though I was only a young boy at the time; and I also saw the one at Simpson's. It might be interesting for historical reasons if your father could give a sketch and description of the 3-H.P. he first put to work actually doing work in the carpenter's shop. Few people have any idea that anything workable was done so early; yet there is no doubt that there was the egg from which all gas and oil engines, motors, and even aeroplanes were hatched. . . . I am anxious to rescue for Tyneside the honour that your father brought to it. What a lot of interesting matter he could give if he would just jot-down a bit at a time all the things he has been engaged on.

Please thank him for the pleasure he has given me in placing on record so much as he has done, and tell him he has made me very hungry for more.—Yours very sincerely,

(Signed) GEO. H. HASWELL.

The improvements in this engine over the vertical type were as follows:

1.—The cooling of the working cylinder was effected by a water jacket cast or formed around the same.

2.—Arrangements were made so that an explosion took place at each side of the piston, to increase the power of the engine.

3.—A side shaft was introduced, operated by bevel wheels from the engine crankshaft, to control the ignition apparatus and the exhaust slides.

4.—The ignition of the charges of gas and air was effected by means of an electric spark; an electrical machine with "jump spark" being first applied, and replaced later by the "make-and-break" system with disrupter cams on the side shaft.

As in the case of the vertical "cogwheel" engine, the gas and air charges were introduced and ignited at atmospheric pressure; the ignition taking place at about half stroke, and the exhaust or burnt gases being expelled during the whole of the return stroke. Patents were not taken out by James Robson for the improvements in construction, details, and the methods of carrying-out the electrical ignition, as he was experimenting on the possibility of using the gases under compression. Unfortunately, his ironmongery business establishment in King Street, South Shields, was (as previously mentioned) entirely destroyed by the gable wall falling into the excavations. An action at law arose out of this disaster; and although Robson won his case both at Durham and in London, his experiments in connection with the gas-engine were brought to a standstill till some years after.

VACUUM TYPE OF GAS-ENGINE.

About this time, James Robson's uncle died; and as his own father was getting old, he found it necessary to relinquish his ironmongery business at South Shields, as he had to devote practically all his time to the building and quarry business at North Shields. During his spare time, however, he found the opportunity to make a vacuum type of gas-engine. This engine consisted of a single cylinder having two pistons—one connected directly to the crankshaft of the engine, and the other loose; a piston rod attached to the same passing out at the opposite end of the cylinder. When the crank or main piston was nearing the end of its out-stroke, it drew in a mixture of gas and air, which, upon ignition, forced the loose piston outwards, where it was held by suitable clips acting on the piston-rod. A vacuum was thus formed, and the main piston, on turning the dead-centre at its extreme out-stroke, was sucked-back to the inner end of its stroke, when the loose piston was released and travelled part of the next out-stroke of the main piston, after which a fresh charge of gas and air was drawn in between the two pistons, and the cycle repeated.

It will be gathered from the foregoing that James Robson was an enthusiast. He was always looking well ahead of the times, and clearly foresaw that in the future the internal combustion engine would be one of the principal prime movers for generating power in a convenient and economical manner. In a letter which appeared in "The Engineer" for July 29, 1864 (p. 74), he stated that the cost of fuel for driving a gas-engine using town gas would be reduced to 1d. per horse-power per hour—a statement which was much doubted at the time, but which has since been proved to be correct. This letter was written in connection with a discussion relating to an article in "The Engineer" for July 1, 1864 (p. 12), and is given in full below.

COAL-GAS MOTIVE POWER.

Sir,—Perhaps the following experiment on the explosive force of an exploding mixture of coal gas will be acceptable to many of your readers at the present time.

To ascertain the explosive force of an ordinary coal-gas mixture on a piston, I placed in a common tin cylinder, 3 in. by 14 in., a mixture of 1 of coal gas, 9 of air. I exploded them by a gas-jet, but without allowing the slightest escape of the explosion.

An average of twelve explosions gave a pressure of 45 lbs. per sq. in., by an air-gauge. The pressure was momentary, but still of much longer duration than the time occupied in the stroke of small engines. Theoretically, the pressure should have been about 150 lbs. per sq. in., as there is about 4000° temperature generated—thus showing a great loss in an explosive engine. But still, this actual practical pressure will enable small gas-engines to be worked at an economical rate compared with Schiele's water-turbine, mentioned by your correspondent, J. J. Birckell.

In this town we have a pressure of 80 lbs. water, at a cost of 7d. per 1000 gallons. Now, Mr. Editor, you will likely agree with me that this is a fair town's water-pressure and price for medium quantities of water. Now, to give out 1-H.P. with this pressure, it would require about 1100 gallons of water per hour, costing about 8d. per hour per horse. An explosive coal-gas engine should not use more than 50 c.ft. of gas per hour, which I find by an engine without electricity being used to ignite; the cost of gas being 3s. 6d. per 1000. Therefore the cost per horse-power per hour is only 2d.—not an extravagant price for a small engine. In my opinion, from the attention I have paid to the subject, I consider the method of using the direct explosive pressure most wasteful. It is like the first, or Newcomen engine, to our present engines. I am busy with an engine by which I expect to obtain a much higher degree of efficiency, only costing for gas 1d. per horse per hour. When completed, I shall be happy to forward to "The Engineer" diagrams of its working.

JAMES ROBSON.

July 25, 1864.

James Robson then designed an engine to work on what was called the spring type atmospheric pressure principle.

This engine had two vertical cylinders; the smaller one having a piston operated from the fly-wheel shaft, which drew-in a charge of gas and air, and which, upon ignition, drove-up the piston in the second or larger cylinder against a series of powerful springs. To this piston a toothed rack was attached, which, in turn, engaged with a pinion running loose in one direction on the fly-wheel shaft, but by means of rollers and wedges engaged with it in the reverse direction. When the piston and rack were forced out by means of the explosion, it turned the pinion loosely on the fly-wheel shaft; but on the return stroke under the action of the springs it engaged with, by means of the rollers and wedges, and turned the fly-wheel shaft, upon which a driving pulley was fixed. This invention was allowed to remain dormant for many years, when James Robson revived and covered it by patent No. 4050 in 1880. One of these engines, which was called the patent "London" gas-engine, and which was only intended for small powers, was shown at the Cattle Show held in the Agricultural Hall, Islington, London, in December, 1880.

THE "TWO-CYCLE" GAS-ENGINE.

This is the true two-to-one cycle, in which all the operations of charging, compressing, ignition, combustion, and exhausting are performed in a single cylinder having a single piston, and in one revolution of the crankshaft, or one complete to-and-fro movement of the piston itself in the engine cylinder, and without the addition or assistance of any pump or other contrivance whatever.

In 1877, James Robson took out a patent (No. 2334) for an engine of the two-cycle compression type. This is the original patent, and is the pioneer of those engines utilizing the front end of the working piston as a pump for drawing and compressing the mixture of gas and air, and the back end for the explosion or motive power stroke. In this engine the mixture of gas and air drawn into the cylinder was compressed alternately by the front end of the piston into the two chambers to a pressure of 30 to 35 lbs., wherein the gaseous mixture was ignited; the resultant pressure due to combustion being admitted to the back end of the cylinder by a suitable slide valve, which forced the piston forward at each revolution of the crankshaft. It should be stated that only one engine of this type was made, and it was used for driving the machine tools in James Robson's own workshop at North Shields, until replaced by his 1879 patent gas-engine.

All previous compression gas-engines working on the two-cycle principle used one or more separate pumps for introducing the explosive mixture into the motor cylinder; the alternative being, as in the case of the "Otto," or four-cycle principle, that one impulse only was given during four strokes of the piston or two revolutions of the crankshaft.

Mr. James D. Roots, in his article on "The Cycles of Gas and Oil Engines," published in "The Engineer" of Oct. 1, 1897 (and issued later in book form), says: "The earliest invention on this cycle that I can find is Robson's." And he was right, as James Robson himself had made a most exhaustive search before taking out his patent in England and other countries. The first claim in connection with this patent is as follows: "Using one side of a piston working in a cylinder to compress a mixture of combustible gas or vapour and air into a reservoir, to be there ignited, and the resultant expansion and pressure to be utilized on the opposite side of the said piston for giving-out motive power substantially as hereinbefore described, or any mere modification thereof." It will be seen that the claim was a very broad one, covering absolutely the use of the front end of the piston as the gas and air pump in conjunction with the back end of the same piston as the motive power side.

James Robson then took out another patent (No. 4501) in the year 1879, for an improved and simplified engine, and James D. Roots, in the article already referred to, states that he selected this patent as the first representative of this type—"the specification being much clearer than the earlier one, and devoted exclusively to this cycle."

The first claim in this patent is as follows: "The arrangement and general combination of engine by which a charge of inflammable gases is drawn-in, and then compressed into a reservoir by one side of a piston working in a cylinder, and the expulsion and replacement during the backward stroke on the other side of such piston of the burnt gases of the previous forward stroke by the compressed gases from such reservoir, and completing the compression of the gases by the continued backward motion or ascent of such piston, and explosion on the forward stroke for obtaining motive power, substantially as hereinbefore described, or any mere modification thereof."

As in the case of James Robson's 1877 patent, the claim is a very broad one, and it clearly shows that he foresaw the possibility of performing all the operations of charging, compressing, exploding, and exhausting in the one cylinder and in one revolution of the crankshaft. The first of these engines was made early in 1879, and put to work in James Robson's experimental workshop at North Shields, where it was in regular use until he left the North of England in 1880. In this engine, also, both ends of the cylinder were closed; the front or piston-rod side of the piston being used as the pump to draw in the charge of gas and air, when it was compressed into an intermediate reservoir to a pressure of about 6 lbs., in readiness to be delivered to the back end or working side of the piston, where it expelled, or assisted to expel, the products of the previous combustion. The piston then compressed the delivered gaseous charge, when it was ignited at the point of highest compression—viz., from 30 to 35 lbs.—and during the next out-stroke the charge expanded, performing a working stroke. Near the end of the working stroke the exhaust-valve or

port was opened, and a fresh gaseous charge admitted through the inlet valve to the cylinder, which assisted in expelling and replaced the exhaust gases. This fresh charge was then compressed and ignited, thus continuing the cycle.

The patent included a system of starting by means of the exploded gases, a portion of which was allowed to pass through a small retaining valve into a reservoir, and retained there until required to start the engine. This system may be considered the forerunner of the principle, now extensively made use of to-day, for starting internal combustion engines in which, before shutting-down, and after the fuel has been shut-off from the engine, use is made of the energy in the fly-wheel to run the engine and force a portion of the compressed air from the engine cylinder into a reservoir, where it is retained until required for re-starting the engine, which is effected by admitting it to the engine cylinder (instead of to the cylinder of a small starting engine) for one or more cycles, until the engine commences to run in the ordinary manner.

All the two-cycle engines of the present day—that is, where the front end of the piston working in a single cylinder is used as the gas and air pump and the back end as the motor—are based upon the principle of James Robson's patent, the only real difference being that, whereas in James Robson's engine the inlet was controlled by means of a valve opening into the back or working end of the cylinder, the majority of the two-cycle engines of to-day use the piston itself for opening the inlet port; this port being situated in the wall of the cylinder and opened by the forward movement of the piston on the working stroke. This latter arrangement, however, does not so effectively clear out the burnt products of combustion as is done by James Robson's arrangement.

It is a matter of the greatest interest, so far as the British gas-engine is concerned, to know that while the four-to-one or "Otto" cycle was invented by a Frenchman (M. Beau de Rochas), developed and perfected by a German (Dr. N. A. Otto), and introduced to this country by an English firm (Messrs. Crossley Bros., of Manchester), the two-to-one or "Robson" cycle—*i.e.*, a compression engine in which all the operations take place in the one cylinder, having a single piston and giving an impulse at each forward stroke of the piston and in one revolution of the crankshaft—was invented by an Englishman (James Robson), and was perfected, manufactured, and introduced to the world in the year 1881 by an English firm, Messrs. Tangye, of Cornwall Works, Birmingham.

Many hundreds of these engines were made, sold, and sent to different parts of the world. The engines were rated by their nominal horse-power; the brake-horse-power being about 33 p.ct. more than the nominal. They were constructed to work with town's gas; the consumption being about 35 c.ft. per B.H.P. per hour in the large size, and rather more in the smaller sizes. This engine was known as the "Tangye" gas-engine—Robson's patent, and was manufactured in four sizes. It was awarded the Special Gold Jubilee Medal at the Royal Cornwall Polytechnic Exhibition held at Falmouth in 1882.

These engines, which were of neat and simple design, were up to a few years back still in use, and gave such satisfaction to their users that they were reluctant to replace them, even with more up-to-date engines.

Gas Hammer.

The next important invention of James Robson was the gas forging hammer, which was covered by patent No. 4050 taken out in the year 1880, in conjunction with a gas-pump. A working model of the gas hammer some 18 in. in height, and which is still in possession of the author, was made in the year 1879. This model gas hammer was shown at the Royal Cornwall Polytechnic Exhibition at Falmouth some years later, when it received the bronze medal. The hammer was not, however, constructed and manufactured for the open market until about the year 1883 or 1884. This was the first gas forging hammer ever made, sold, and put to work; and like Robson's gas-engine it was manufactured and put on the market by Messrs. Tangye, Cornwall Works, Birmingham, so to them belongs also the honour of introducing the first gas forging hammer to the general public. Of the different sizes made, about one hundred were put to work, and among the users may be numbered H.M. Government at Woolwich Arsenal, and several of the leading gas-works, where they have given long and general satisfaction—indeed, some of these hammers are at work even to-day. The gas hammer was really introduced before its time, and therefore the demand for it was not large; but there is not much doubt that it will come again to the front one of these days as a new invention.

As already mentioned, James Robson's patent No. 4050 of 1880 for his forging hammer, described a direct-acting gas-pump for raising water or other liquids. This pump operated on lines somewhat similar to the gas hammer, embodying the same principle of action—the hammer head or tup being replaced by a water piston in a cylinder. On the explosion stroke, the water was simply passed from one side to the other side of the piston, and on the return stroke, under the action of the springs, the water was raised. The pump piston or bucket is attached to the free piston's rod; and when the free piston is making its out-stroke, it displaces the fluid from one side of the water pump piston or bucket to the other side through a valve, at the same time compressing the energy-absorbing springs. These now draw the free piston and water pump piston back and force the water or fluid through the outlet valve, and recharge the pump through the inlet valves as in an ordinary pump.

One of these pumps was constructed by Messrs. Tangye about the year 1881 to 1882, having a water cylinder about 4 in. dia. by 10 in. stroke, and which was capable of raising the water to a height of about 30 ft. But pressure of work in connection with the gas-engine did not allow of sufficient time for James Robson fully to develop the gas-pump, which has therefore remained in abeyance.

Later Work.

James Robson was a born engineer and inventor with original ideas, and in addition to the many devices for which he took-out patents in connection with internal-combustion engines, he patented and put on the market several appliances in connection with other public requirements. In his latter years he continued to be actively engaged and devoted a large amount of his time in connection with experiments relating to a direct-lift aerial machine. He had accumulated a quantity of useful data in relation to the weight that could be lifted per sq. ft. area of propeller blade; but time stepped in and prevented the realization of his last ambition.

He retained his mental faculties almost up to the hour of his death, which took place on Aug. 15, 1913. On the headstone of his grave are inscribed the words "Inventor of the Two-Cycle Internal Combustion Engine," as a memento of his right as the first and true inventor of this important and now world-wide adopted cycle in connection with gas and oil engines.

The Modern Gas-Engine.

James Robson is still represented at the works of Messrs. Tangye by the author of this paper, who assisted his father with many of his experiments, particularly those in connection with the development of the two-cycle gas-engine. It is therefore of interest to note the great advance that has been made in the construction and working of the internal-combustion engine since Robson made his first experimental gas-engine.

Among the chief requirements of a modern gas-engine to fulfil the many exacting duties to which it may be applied, may be briefly enumerated the following: Variable admission governing; variable-timed magneto electric ignition; forced-feed lubrication to the cylinder and piston, &c.; ring lubrication to the crank and side-shaft bearings; thorough cooling of the cylinder and combustion chamber; automatic starting with compressed air; coupled or multiple cylinder engines.

The march of time has brought about many improvements, and new designs of engines embodying radical changes in principles of operation have been introduced, all of which have had the effect of considerably reducing the consumption of fuel per horse-power. This has enabled a very high standard of economy to be attained; so much so, that whereas about the time when the two-cycle gas-engine was introduced, gas-engines could only be numbered by hundreds, to-day they may be counted by hundreds of thousands.

The introduction some years ago of the suction gas-producer, the use of which in connection with gas-engines was foreshadowed in a letter, over the initials of "P.H.," to the Editor of "The Engineer" as far back as the 'Sixties (Aug. 5, 1864), enabled a great extension to be made in the use of the gas-engine.

The advent of the suction gas-producer provided the means whereby the engine could be worked economically and quite independent of the town's gas supply, as it can be installed in places where the price of town's gas is high, or where it is not available. Like the gas-engine, improvements have continually been made in the construction and operation of the suction gas-producer, and to such an extent that, in addition to using anthracite, coke, and charcoal, it is now adapted for dealing with an enormous variety of vegetable and other fuels.

From the date of James Robson's first engine, the forward movement in the use and improvement of the gas-engine has been one of continued progress. It commenced with the engine of a fraction of a horse-power, of limited purpose, and high fuel consumption, and has continued to the present day, when there is practically no limitation to the power of the engine, the purpose to which it can be applied, or the kind of fuel which can be utilized for the production of the power in such an installation, and which has been rendered possible by the introduction of the suction gas-producer.

In bringing the reading of this paper to a close, I should like to impress on the minds of all present the very high position that Birmingham has occupied in connection with the development of the internal combustion engine. It has the honour, through one of its leading engineering firms, of introducing the "two-cycle" gas-engine and the gas forging hammer to the world—an honour that will live through all time.

The lecture, of considerable length, was illustrated by means of admirable slides showing the evolution of the British internal-combustion engine.

The President (Mr. W. Batt), in proposing a vote of thanks to Mr. Robson, commented upon the excellence of the lecture, which did not, however, lend itself to much discussion. So far as that Association was concerned, it differed, in kind, from the papers usually given; so that interest was perhaps more widespread. It was all the more interesting from the fact that the information, which had been given with so much detail, came (almost first-hand) from the son of the inventor, whom he assisted in many of his engineering experiments.

Mr. C. F. W. Rendle (Redditch) seconded the vote.

Mr. BRYAN DONKIN, in support, said it was a revelation to know that the two-stroke principle was a British invention. Some years ago, he assisted his cousin in conducting many experiments in relation to gas-engines. He had come across some very old Tangye engines in small gas-works; and the owners were most profuse in praise of their general reliability. He knew of some who declined to change them for more modern engines. He asked if Mr. Robson had made any experiments with the internal-combustion turbine.

The vote having been carried with acclamation,

Mr. ROBSON, in reply, said he desired it should be better known that the two-cycle gas-engine was a British invention, that the inventor was a Tynesider, and that Birmingham had the honour of manufacturing it and introducing it to the world. It seemed to him that the two-cycle and the four-cycle had come to stay. He thought the turbine was still some distance away.

The meeting then terminated.

THE PROPAGATION OF FLAME IN MIXTURES OF ETHYLENE AND AIR.

By WILLIAM RONALD CHAPMAN.

[From the "Transactions of the Chemical Society."]

The "uniform movement" of flame, which occurs when an inflammable mixture contained in a tube closed at one end is ignited at the open end, affords means of comparison between one inflammable gas and another, as regards their general behaviour on burning. The speed of the uniform movement is dependent on the character of the combustible gas and the composition of the mixture that is inflamed; but it is also dependent on the experimental conditions, notably on the diameter of the tube in which the mixture is contained. When desirous of comparing one mixture with another, or a series of mixtures of one inflammable gas and air with that of another inflammable gas, it is essential therefore that the records of speeds employed should have been obtained under standard conditions.

Records of the speed of the uniform movement of flames in all their mixtures with air over the range of inflammability are available for most of the common inflammable gases, as determined in horizontal glass tubes 2·5 cm. in diameter. Thus for hydrogen, reference can be made to Haward and Otagawa, for methane and acetylene to Mason and Wheeler, and for ethane and the higher paraffins, and for carbon monoxide, to Payman. For ethylene, information has not hitherto been available; and, since ethylene is an important constituent of coal gas, it is desirable that it should be.

The present paper records for ethylene (1) its limits of inflammability, and (2) the speed of the uniform movement of flame in all its mixtures with air, as determined in a glass tube 2·5 cm. in diameter.

LIMITS OF INFLAMMABILITY.

The results obtained are given in the table that follows. With tubes of larger diameter the limits would no doubt be wider.

—	Ethylene P.Ct.	Remarks.
Horizontal propagation—		
Lower limit.	3·4	A pale blue flame occupied the upper portion of the tube only.
Upper limit.	14·1	The upper limit flame was tinged with yellow.
Vertical propagation, downward—		
Lower limit.	3·6	Pale blue disc.
Upper limit.	13·7	Pale blue, voluminous flame.
Vertical propagation, upward—		
Lower limit.	3·3	Blue flare of flame.
Upper limit.	25·6	Smoky, yellow flame, carbon deposited on sides of tube.

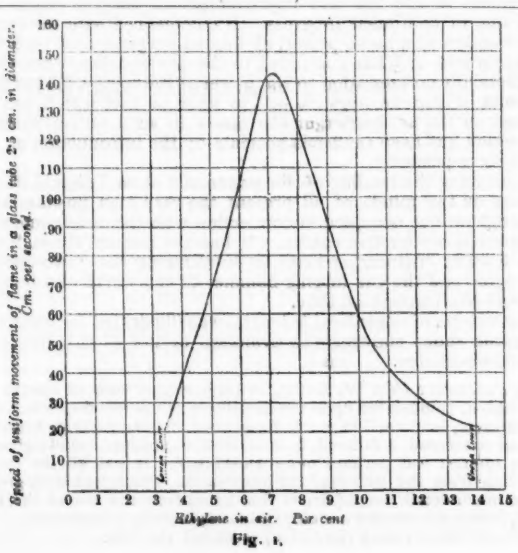

Speed of uniform movement of flame in a glass tube 2·5 cm. in diameter. Cm. per second.
Ethylene in air. Per cent
Lower Limit
Upper Limit

Fig. 1.

SPEED OF PROPAGATION OF FLAME.

The measurements of the speed of the uniform movement are most conveniently displayed in diagrammatic form (see fig. 1). The curve relating speeds with percentages of ethylene is of a form similar to that obtained with other hydrocarbons—that is to say, the speed of the flame increases rapidly as the percentage of ethylene is increased from that in the lower-limit mixture until a maximum range is reached, after which it decreases. As with each of the paraffin hydrocarbons under the same conditions of experiment, the speed of the flame tends towards a value of 20 cm. per second, which would therefore appear to be a constant for the hydrocarbons.*

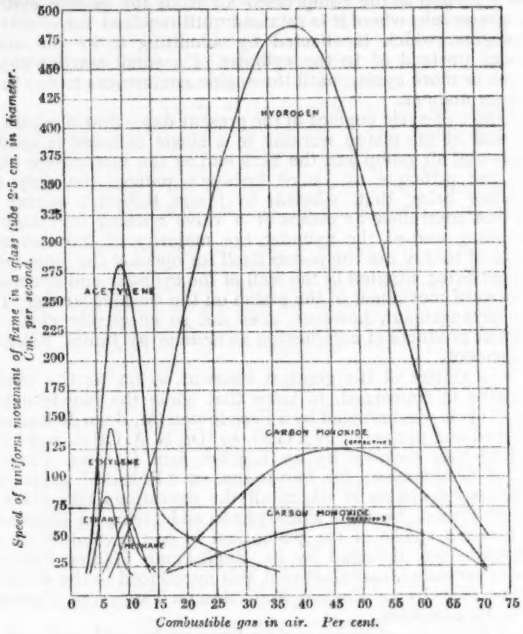


Fig. 2.

In fig. 2 the speed-percentage curves for the uniform movement of flame in mixtures of air with hydrogen, carbon monoxide (the "effective" values and those "observed" when saturated with water vapour at 12° and 750 mm.), methane, ethane, acetylene, and ethylene respectively, as determined in horizontal glass tubes, 2·5 cm. in diameter, are plotted to the same scale for comparison. The curve for ethylene is intermediate in character between those for methane and acetylene—not only as regards its maximum range, but also in respect of the manner in which it flattens as the upper limit is approached. This flattening of the curve towards the upper limit is just noticeable with methane (it becomes more pronounced when tubes of larger diameter than 2·5 cm. are employed), is quite distinct with ethylene, and is very marked with acetylene, where it is due to exothermic decomposition of excess of the gas. With ethylene, as with the paraffin hydrocarbons, the flattening of the curve as the excess of combustible gas becomes greater is probably due to the liberation of hydrogen at an intermediate stage in the combustion of the hydrocarbon.

The mixture of ethylene and air that contains ethylene and oxygen in combining proportions to form carbon dioxide and steam contains 6·5 p.ct. of ethylene; and this mixture has the maximum calorific effect. The maximum speed of uniform movement of flame is, however, obtained with mixtures containing between 7 and 7·25 p.ct. of ethylene. This "displacement" of maximum-speed mixture, which has been observed to a greater or less extent with all mixtures of inflammable gases with air, has been shown by Payman to be an effect of mass-action.

Given data respecting the compositions of the maximum-speed mixtures with air of individual combustible gases, and the speeds of flame in them, it is possible to calculate the maximum-speed mixture, and the speed obtainable, when a composite gas, such as coal gas, containing the individuals in known proportions, is mixed with air. Taking as an example a coal gas containing:

	P.Ct.
Carbon dioxide	2·6
Ethylene	3·0
Carbon monoxide	14·1
Hydrogen	46·9
Methane	19·0
Ethane	4·5
Nitrogen	9·9

the composition of the maximum-speed mixture can be calculated by means of the formula:

$$M = 100/\left\{\frac{a}{M_a} + \frac{b}{M_b} + \frac{c}{M_c} + \ldots\ldots\ldots\right\}$$

in which a, b, c, . . . are the percentages of the individual gases

* With mixtures of carbon monoxide and air, the speed of flame at the limits (under the same conditions of experiment) is also about 20 cm. per second; whereas with the lower limit mixture of hydrogen and air, the speed is abnormally slow—namely, 10 cm. per second.

in the coal-gas, and M_a, M_b, M_c . . . the percentages in their respective maximum-speed mixtures with air. The result of the calculation is 22·2—meaning that the maximum speed of uniform movement of flame in a tube 2·5 cm. in diameter is obtained when 22·2 p.c. of the coal gas is present in the mixture with air.

The value of the speed of flame in this mixture can be calculated from the formula:

$$S = \frac{l_{S_l} + m_{S_m} + n_{S_n} + \ldots\ldots}{l + m + n + \ldots\ldots}$$

in which l, m, n, . . . are the amounts present of the maximum-speed mixture with air of each constituent gas, and S_l, S_m, S_n . . . are the speeds of flame in those mixtures. In the instance given, the calculated speed (using the "effective" value for carbon monoxide) is 210·5 cm. per second.

So far as calculations for different compositions of coal gas are concerned, a sufficiently close approximation can be obtained by grouping together the paraffins and olefines and treating them as though they were methane. Thus, for the sample of coal gas taken as an illustration, the maximum-speed mixture calculated on this assumption contains 22·7 p.c. of coal gas, and the speed of flame in that mixture is 206·2 cm. per second.

This research has been extended to include the study of the propagation of flame in mixtures of the higher members of the olefine series of hydrocarbons with air. For propylene, for example, the limits of inflammability (horizontal propagation of flame) are 2·6 and 7·4, and the maximum speed of the uniform movement, under the same conditions of experiment as for ethylene, is 90 cm. per second, obtained with mixtures containing between 4·8 and 5·3 p.c. of propylene. The significance of a comparison between the values obtained for ethylene, propylene, and butylene on the one hand and ethane, propane, and butane on the other will be discussed in a future communication. For the present it may be mentioned that the higher olefines correspond more closely to the paraffins than does ethylene, so far as the speed of uniform movement of flame in their mixtures with air is concerned. Coal gas contains, in addition to ethylene, appreciable quantities of propylene and butylene, which are usually recorded in analyses as ethylene (or as "olefines"), so that the grouping together of paraffins and olefines when making such calculations as are described above would, in the majority of instances, cause even less departure from an exact calculation than appears in the illustration that is given.

LIFE AND ACCURACY OF GAS-METERS.

Many New England gas companies are now having their records of meter tests summarized; and results have lately been quoted in a paper read by Mr. H. A. Norton, of Boston (Mass.), who says that a study of the summaries demonstrates the necessity for a periodical test date (which means the elimination of incorrect meters), and a periodical repair date (to which every measuring device is entitled). Some time ago, he recommended a five-year periodic test, and a ten-year periodic repair date; but since then the results of his observations have inclined him to extend these periods to a cycle of seven and fourteen years respectively. Quoting from the records of a company who had a five-year periodical test date over a period of twenty-two years, he said these showed the accurate meters removed from service from any cause in the first year to be 85 p.c.; second year, 90 p.c.; third year, 86 p.c.; and fourth year, 82 p.c. The proportion for the whole of the meters, including all five-year service meters, was 82 p.c. correct. The meters which had been in service for five years, which were removed for periodical test, showed 70 p.c. correct; and these correct five-year old meters, which were again replaced in service and once more brought in at the end of ten years' service, showed 70 p.c. correct. The ten-year correct meters, returned to service and tested again at the end of fifteen years, showed 72 p.c. correct; and the correct fifteen-year meters, which were returned to service for an experiment and removed at the end of twenty years, showed only 52 p.c. correct. In the case of another company (whose existence had only reached seventeen years), the meters from one to five years in service showed 88 p.c. correct; one to seven years in service, 86 p.c. correct; and one to seventeen years in service, 80 p.c. correct. The meters which had been in service from eleven to seventeen years without repairs were 60 p.c. correct. In addition to a periodic test date and a periodic repair date, the results of his investigations have convinced him that there should also be a periodic date for condemning old meters, and replacing them with new meters of increased strength and capacity.

A New Gas-Igniter.—According to the "Illuminating Engineer," the "Perpetuum" gas-igniter, described in "Gas und Wasserfach," represents an attempt to use a discharge of static electricity to kindle a stream of gas. The apparatus, which is housed in a metal case terminating in a cylinder, contains an electrophorus apparatus which is manipulated by a knob outside the case. The two contacts, across which the spark passes, are situated at the end of the cylinder. This is pierced by a series of holes from which sparks emerge. It is stated that in recent tests upwards of 100,000 successive ignitions have been made, without any appreciable deterioration in efficiency taking place.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Therm and Gas-Works Practice.

SIR,—The new conditions resulting from the alteration in the basis of the sale of gas do not appear to be sufficiently appreciated. The therm is something more than a change of units. It has completely altered the aspect of the manufacture of gas, so that the fundamental principles of gas-works practice will require considerable revision in the near future. The sale of heat units is quite a different proposition from the sale of cubic feet, because it will become economically essential to recover from the coal as many heat units as possible in such a form as to command the highest price that heat units will realize. The usual methods of gas manufacture necessitate disposal of many millions of heat units in the form of residuals at a much lower price than could be obtained if they were present in the gas; and, incidentally, they are uneconomical.

Assuming gas at 1s. per therm, and taking average yields, a ton of coal will produce:

		£ s. d.
Gas, 16,000 c.ft. at 450 B.Th.U. =	72 therms at 1s.	= 3 12 0
Coke, 10 cwt.	at 35s.	= 17 6
Tar, 10 gallons	at 6d.	= 5 0
Sulphate, 28 lbs.	at 14s. cwt.	= 3 6
	Total revenue per ton . .	£4 18 0

Now assume that the coal is completely gasified in a single process producing:

Gas, 60,000 c.ft. at 350 B.Th.U. = 210 therms at 1s. = £10 10 0

The increase in revenue from a ton of coal will be approximately 100 p.ct. This figure does not represent the whole of the additional profit, as it is obvious that production costs will be considerably lower with the total gasification process. The lower capital cost of the gasifying unit, reduced repairs and maintenance, and absence of ammonia scrubbers and washers, tar and liquor tanks, sulphate plant, coke-handling arrangements, &c., will more than counterbalance any increased exhauster, purifier, and storage capacity required; and the labour charges will also be reduced.

The above figures for residuals are liberal; and the tendency will be downwards.

To produce a revenue equal to that of the total gasification process, the residuals from a ton of coal would have to realize the following amounts:

Coke.	£3 15 0
Tar	1 0 0
Sulphate	0 17 0

Is it conceivable that such prices will ever be obtained, even with an enormous demand and a restriction of residual output from gas-works? What earthly chance will coke have against the cheap gas that will be available? On the above figures, gas could be very profitably sold at under 6d. per therm. Tar, even if fractionated to the ultimate limit, will be supplied in all required quantities by coke-ovens and various systems of carbonization; while cheap fertilizers from synthetic and other sources will take care of the price of sulphate. No! the gas-works of the future will be a "gas" works pure and simple, with a much greater output, a much simplified plant, and a smaller and more compact works. Its revenue will not be affected by the residuals market, and its business will be to push the sale of cheap gas for every possible use.

It will be generally admitted that, so far as the manufacturing side is concerned, it is quite practicable to produce low calorific value gas at a much lower cost than the gas that is being turned out to-day. But what of the distribution department? The problem of increased volumes is with us already; and it will have to be tackled some time or other. The alleged heavy additional capital expenditure is the chief lion in the path; but is there going to be no return? Suppose that, through sudden industrial developments or other causes, a gas-works authority found itself faced with an increase of 100 p.ct. in its consumers, it would naturally mean additional capital expenditure; but it would be justified by the increased revenue. The converse is also true—that if the authority doubled its revenue, it could afford the additional expenditure; and, as shown above, it can double its revenue by the sale of low calorific gas. But, when analyzed, is this problem of distribution so formidable? The gas, instead of being diluted at the burner, is to be diluted at the works, and a different design of burner adopted. Will the new design of burner require as high a pressure at the point of combustion? Probably not. It may be found that a very slight increase in pressure at the works will do the trick.

To look forward still further, the gas-meter is a relic of the sale by volume. Is a works with a tremendous output in cheap gas going to retain the meter? Is it not possible that the gas may be sold at the rate of so many therms per point, or by some other empirical method? A gas supply at (say) 350 B.Th.U. and no residuals may appear too revolutionary at present; but the tendency is in that direction, and it must inevitably come. Steaming retorts, carburetted water-gas plant, and accessory gasification units are the thin end of the wedge; and the demand is going to be for "heat units and still more heat units."

It is really surprising what feeble attempts at the conservation of heat have been made by gas engineers. Apart from the recuperative setting, there is hardly an instance where it has been tackled in an intelligent manner. The gas manager in the majority of cases withdraws his coke hot, carefully cools it down by quenching, takes it to his water-gas plant, and heats it up again. If he tinkers with the question by steaming his retorts, he makes no attempt to utilize the sensible heat of the gas. He cools his gas, tar, and ammonia by various means by which many heat units are dissipated, uses a further lot of units in pumping, washing, and scrubbing, and more units still in reheating and distilling his tar and liquor. Curtailment of these

considerable losses will now be vitally important, for no gas manufacturer will be able to go on selling heat units with one hand and throwing them to the four winds of heaven with the other. Every heat unit that can be wheedled out of the coal must be chased into the gas; and the shorter the chase, the greater the spoils.

Cheap gas is the cry; and that is why gas-works will ultimately turn to total gasification plants, and the gas-works as we know them will be entirely redesigned. The change will slowly but surely take place. First by the utilization of waste heat from various sources, then by the adoption of direct processes for separating tar and ammonia, and by the increasing use of producers for gas making. Finally, someone will wake-up to the fact that he is selling heat units and can get the goods he wants by a simple single-stage process; and complete gasification will have arrived. At present, the total gasification plant is only in its early stages. It will be improved and developed as time goes on. It is, however, evident that in some cases this development is being directed along the wrong lines; and it will be expedient to state what the essentials of the process are.

The type of apparatus in which a vertical retort is superimposed on a producer is not good. The method of heating by burning the blow gases round the outsides of the retort is inefficient—the heating should be done internally and direct. The fuel bed should be comparatively shallow for efficient heating and to prevent hanging-up; there should be no cessation of gas evolution during the blowing period; the plant should produce its own steam; and, finally, it should be a complete gasification plant.

The gas engineer who is in the fortunate position of having to extend his plant should carefully consider the lay-out of his carbonizing section, with both eyes on the fact that he has got to produce therms in such a form that they will yield the greatest return on the capital invested—that means cheap gas.

A. MACGREGOR.

43, *Whitelow Road, Chorlton, Manchester, Jan.* 10, 1922.

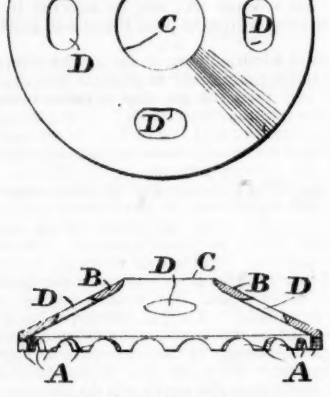
REGISTER OF PATENTS.

Gas-Burners.—No. 171,778.

MOORE, M. A., of Topeka, Kansas, U.S.A.

No. 24,317; Aug. 20, 1920.

This invention relates to gas-burners, more especially of the heater type; and it has for its object to provide for the mixing of an additional supply of air or oxygen with the supply of gaseous mixture to the burner, and accordingly "cause a greater or more extended flame or heat unit." Also, when the gas is only about half up to standard, "the flame will be brought above the burner and will supply as much heat as if the gas were of standard quality."



Moore's Heating Burner.

A plan and a sectional elevation of the arrangement are shown.

The burner head comprises a lower cylindrical portion which has a continuous plurality of underneath notch-formed air inlets A in its lower ledge. It has a crowning upper flame surface B (of frusto-conical shape) sloping symmetrically along its lateral portion downwardly from a central upper opening or crater C of circular shape, which constitutes the main flame-orifice. In the sloping portion are provided also flame orifices D, oblong in outline and four in number, and arranged in relation to the central opening or orifice. This orifice, with the co-operating group of flame orifices, provides for producing a broad flame, and results in a "powerful heat-unit."

It is especially emphasized that the central or crater flame orifice C is of greatly enlarged flame-emitting capacity, being much larger than the lateral flame emitting orifices D. By practical experience it has been found that with this fitting it is possible to mix an amount of air or oxygen to the gaseous mixture that will cause a greater or more extended flame or heat unit.

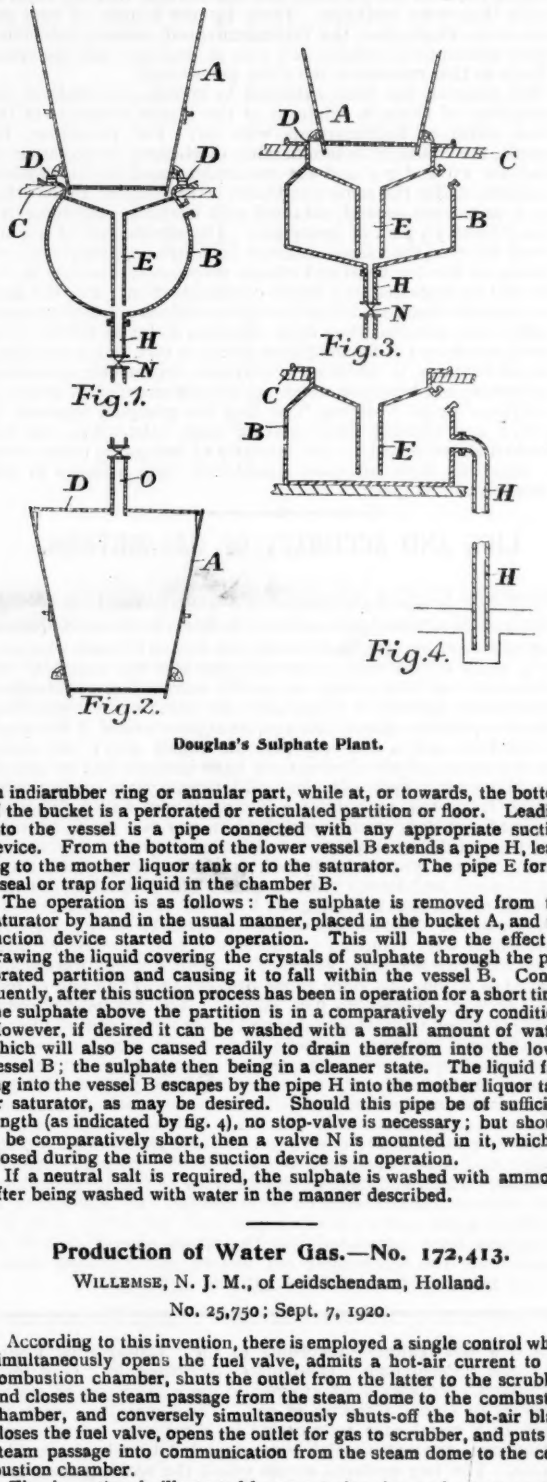
Sulphate of Ammonia Manufacture.—No. 172,337.

DOUGLAS, R. P., of Bolton.

No. 31,970; Sept. 20, 1920.

This invention consists in the use of a removable bucket having a perforated or reticulated base for the sulphate of ammonia in connection with a vacuum chamber, the upper part of which is provided with a pipe or tube extending into proximity to the bottom thereof, through which liquid from the perforated base is fed into the vacuum chamber. This latter, in conjunction with the depending tube, forms a seal or trap; the liquid falling from the perforated base passing through the liquid contained in the vacuum chamber and through the outlet pipe to the mother liquor tank or saturator.

Four forms of the arrangement are shown. In figs. 1 and 2 a wooden or like bucket A is used, having inclined sides or walls. This bucket fits upon a vessel B having flanges resting upon a plate or support C. A joint is formed at D between the bucket and the flanges by



Douglas's Sulphate Plant.

an indiarubber ring or annular part, while at, or towards, the bottom of the bucket is a perforated or reticulated partition or floor. Leading into the vessel is a pipe connected with any appropriate suction device. From the bottom of the lower vessel B extends a pipe H, leading to the mother liquor tank or to the saturator. The pipe E forms a seal or trap for liquid in the chamber B.

The operation is as follows: The sulphate is removed from the saturator by hand in the usual manner, placed in the bucket A, and the suction device started into operation. This will have the effect of drawing the liquid covering the crystals of sulphate through the perforated partition and causing it to fall within the vessel B. Consequently, after this suction process has been in operation for a short time, the sulphate above the partition is in a comparatively dry condition. However, if desired it can be washed with a small amount of water, which will also be caused readily to drain therefrom into the lower vessel B; the sulphate then being in a cleaner state. The liquid falling into the vessel B escapes by the pipe H into the mother liquor tank or saturator, as may be desired. Should this pipe be of sufficient length (as indicated by fig. 4), no stop-valve is necessary; but should it be comparatively short, then a valve N is mounted in it, which is closed during the time the suction device is in operation.

If a neutral salt is required, the sulphate is washed with ammonia after being washed with water in the manner described.

Production of Water Gas.—No. 172,413.

WILLEMSE, N. J. M., of Leidschendam, Holland.

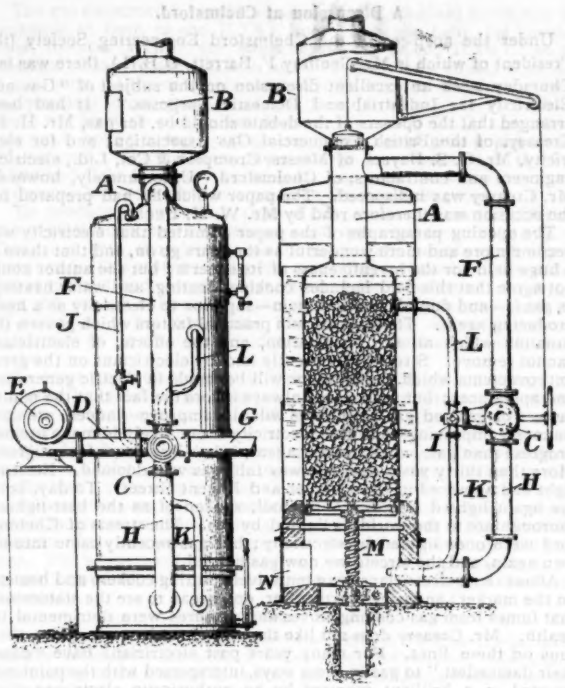
No. 25,750; Sept. 7, 1920.

According to this invention, there is employed a single control which simultaneously opens the fuel valve, admits a hot-air current to the combustion chamber, shuts the outlet from the latter to the scrubber, and closes the steam passage from the steam dome to the combustion chamber, and conversely simultaneously shuts-off the hot-air blast, closes the fuel valve, opens the outlet for gas to scrubber, and puts the steam passage into communication from the steam dome to the combustion chamber.

The invention is illustrated by an exterior view and a part vertical section.

The generator is situated with its grate entirely in the interior of the boiler, which thus forms a water-jacket surrounding the generator.

The latter is connected by a central conduit A with the supply chamber B for the fuel, the passage of which can be closed or opened by means of a valve. The conduit serves at the same time for the discharge of the gases during the action of blowing hot air into the generator.



Willemse's Water-Gas Producer.

The four-way cock C makes connections: (1) Through the conduit D with the fan E; (2) through F with the central conduit of the generator; (3) through G with the scrubber; (4) through H with the space underneath the grate. During the period when hot air is blown into the generator, the conduit D is connected with the conduit H; and during the production of water gas, the conduit F with the conduit G.

With the three-way cock I, there are connected: (1) A conduit J of the steam chamber of the boiler; (2) a conduit to the space under the grate; and (3) a conduit L to the upper part of the generator. The conduits K and L are already in mutual communication during the period when hot air is being blown. They are, however, in turn, closed with respect to the conduit J, with which they are connected during the production of gas.

The plugs of the cocks C and J are secured to the same spindle, carrying a handwheel, connected with the valve for the supply of fuel by means of a cable running over pulleys. During the blowing with hot air the valve is opened—fuel falling into the generator; while the gases escape through the conduit A, but not to the conduit G, which at this moment is closed.

The grate, which is preferably provided with grate bars with pointed ends terminating at a small distance from the generator wall, is secured to the upper end of a vertical screw spindle M, carrying a worm-wheel (prevented from vertical movement) meshing with a worm which, by means of a ratchet mounted upon the worm axle, can be turned in order to move the grate up and down. The spindle and grate being screwed-down, the used-up fuel can be discharged through the outlet N. The upper layers of fuel are then supported by a grate (not shown), which can be introduced through a slot or opening in the furnace wall, adapted to be closed.

Bags for Stopping Gas-Mains.—No. 172,483.

DOUGAN, O. W., of St. Ann's Hill, S.W.

No. 29,613; Oct. 20, 1920.

The stop, according to the invention, consists of a bar having at one end a guide and at the other a clamp. The guide end is inserted in the main, through a lateral hole, following an inflatable bag to stop the flow of gas and meant to hold the air-tube of the bag in position; also to act as a stop to prevent the bag being driven forward by the pressure. The clamp is for fixing the stop to the metal of the pipe adjacent to the edge of the hole.

An illustrated description of the device was given in the "JOURNAL" for Oct. 5 last, p. 40.

The Athlone Urban District Council have applied to the Local Government Board for Ireland for sanction to a loan of £5000, for the purpose of providing working capital for the gas undertaking.

A Reuter's message states that, according to the "Auto," prospecting for oil is still going forward in France. Borings in the neighbourhood of Amberieu-en-Bugey recently led to considerable volumes of gas being released. So abundant, indeed, was the supply that at first it was found impossible to get it under control. The work of leading-off the gas is, however, now being actively pushed forward; and it is hoped that within a short space of time the town of Amberieu will be illuminated by means of this local supply of gas.

MISCELLANEOUS NEWS.

GAS FUND CONTRIBUTION.

Under date of Jan. 9, publication has been made of the following Order of the Board of Trade, under section 7 of the Gas Regulation Act, 1920, prescribing the rate of contribution to the Gas Fund for the year 1922.

In pursuance of the powers conferred upon them by section 7 of the Gas Regulation Act, 1920, the Board of Trade hereby prescribe that—

1.—The rate of contribution to the Gas Fund for the year 1922 shall be three shillings for each million cubic feet of gas sold during the year 1921.

2.—Such contribution shall, on or before April 1, 1922, be paid to the Board of Trade at Great George Street, London, S.W. 1, by any gas undertakers with respect to whom an order under the said Act shall have been made, by cheque made payable to the "Assistant Secretary for Finance, Board of Trade," and crossed "Gas Fund Account."

[The rate is the same as last year.—ED. "G.J."]

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" of applications to the Board of Trade under section 1 of the Gas Regulation Act.

Bristol Gas Company.

The maximum price now authorized in respect of the supply of gas by the undertakers is 4s. 6d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 4·8d. per therm.

Uttoxeter Gas-Works, Ltd.

The standard price now authorized in respect of the supply of gas by the undertakers is 3s. 2d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 15d. per therm.

DECLARATIONS OF CALORIFIC POWER.

Great Wigston Gas Company.—450 B.Th.U. (March 31.)

SPECIAL ORDER.

Sittingbourne District Gas Company.

The Company have applied to the Board of Trade for a Special Order under section 10, to increase their borrowing powers, to make new provisions for the regulation of administration and of gas supply, and for other purposes.

GAS REGULATION ACT ORDER.

There has been forwarded by the Director of Gas Administration a copy of the following further Order made by the Board of Trade under section 1 of the Gas Regulation Act.

United District Gas Company.

After the declared date, the standard price in respect of gas supplied by the undertakers shall be 23d. per therm.

For the purpose of ascertaining the authorized rate of such dividend, any price charged per 1000 c.ft. before the declared date shall be rendered into the equivalent price per therm by dividing it by four-and-two-fifths.

Prepayment meter clauses are included. (Jan. 9.)

PROPOSED INSTITUTION OF CHEMICAL ENGINEERS.

The second meeting of the Provisional Committee was held on Wednesday, the 21st ult.

In opening the proceedings, Sir Arthur Duckham (who occupied the chair) made it clear that he was in the movement not for the purpose merely of forming an Institution, but for the education and production of competent men to handle our chemical industries. Several letters were received containing suggestions for the constitution of the Institution. Mr. D. Brownlie and Dr. E. W. Smith made statements with reference to earlier attempts to form a similar Institution.

It was agreed that, in the first instance, the Institution should be founded as a limited liability company, with permission from the Board of Trade to omit the word "Limited," but that a Charter should be applied for as soon as it became clear that its attainment was possible. A draft of the constitution was submitted and discussed; and it was decided that in its amended form it should be circulated among the members, and that the Chairman should invite an experienced solicitor to attend at the next meeting for its discussion.

It was agreed that the Committee should meet to-day (Wednesday).

Accrington's New Gas-Works.—At a meeting of the Accrington Gas Board, who govern several townships, on Saturday last, Alderman Dewhurst said their new gas-works were progressing very satisfactorily. The completed portion was working smoothly, and the Committee were hopeful that the whole contract would be completed in the near future.

RADIATION PRICE-REDUCTION POLICY.

Important Announcement.

One of the chief aims in view in the formation of Radiation, Ltd., was the elimination—by combined effort—of competitive outlay, so as to effect reductions in the selling prices of gas apparatus. The firms constituting this Company are glad to be now in a position to announce a most important departure in fulfilment of this purpose. This consists of three distinct features:

(*a*) INCREASE OF DISCOUNT ON LIST-PRICED GOODS.

Goods dispatched on and after Monday, the 23rd inst., will be charged as follows:

Gas-cookers, gas-fires, and other listed goods hitherto charged at current list prices, less 12½ p.ct. discount, will now be reduced by a further 7½ p.ct.; so that existing list prices will now be subject to 20 p.ct. discount.

Gas-steam and other radiators, hitherto charged at current list prices, less 22½ p.ct. discount, will now be reduced by a further 7½ p.ct.; so that existing list prices will now be subject to 30 p.ct. discount.

Goods invoiced at net prices will now be reduced by 7½ p.ct. on the existing net rates.

The above reductions do not apply to geysers and industrial apparatus.

(*b*) REDUCTION IN PRICES OF "SLOT" COOKERS.

Packed "slot" cookers with 14 in. or 14½ in. door opening, and not exceeding 33 in. high overall, having two boiling-burners and one grilling-burner in hotplate, will, for all despatches on and after Monday, the 23rd inst., be charged at £4 19s. 9d., in all-black finish. Extras: Front of cornice polished, 1s. Additional boiling-burner, 4s. White enamelled tray, 4s. 6d.

Packed "slot" cooker, 12½ in. door opening, and not exceeding 31 in. high, having two boiling-burners and one grilling-burner, £4 11s. 6d., in all-black finish. Extras as above.

Unlined "slot" cooker 14½ in. door opening, and not exceeding 33 in. high, having two boiling-burners and one grilling-burner, £3 14s. 3d. in all-black finish. Extras as above; and with packed door, 7s. extra.

Unlined "slot" cooker, 12½ in. door opening, and not exceeding 31 in. high, having two boiling-burners and one grilling-burner, £3 7s. 6d. Extras: Front of cornice polished, 1s. White enamelled tray, 4s. 6d. Packed door, 7s.

All above prices are strictly net.

(*c*) REBATE ON YEAR'S TOTAL PURCHASES.

On the aggregate total of goods (exclusive of certain special goods) purchased from any or all of the six firms constituting Radiation, Ltd,—viz., Arden Hill & Co., the Davis Gas-Stove Company, Fletcher, Russell, & Co., the Richmond Gas-Stove Company, Wilsons and Mathiesons, and John Wright & Co.—up to Dec. 31 next, there will be credited a rebate on the following basis:—

Year's Aggregate Total Purchases from Radiation Firms amounting to

£1,000 or over	1 p.ct.
£2,000	2 ,,
£3,000	3 ,,
£4,000	4 ,,
£5,000	5 ,,
£7,000	6 ,,
£9,000	7 ,,
£11,000	8 ,,
£13,000	9 ,,
£15,000	10 ,,

The above arrangements cancel all existing terms; and all goods will be strictly net and payable cash monthly. The rebate will operate from Jan. 1, 1922. As it will be recognized that the above reduction in the price of these "slot" cookers is a drastic one, rebate cannot be allowed off the value of "slot" cookers purchased which are enumerated in this letter; but the purchases of these "slot" cookers will be included in the year's total purchases for the purpose of arriving at the rate of rebate. For example, if a purchaser during the year purchases general goods to the amount of £2600 and "slot" cookers to the amount of £500, he will receive rebate on the £2600 only; but the rate of rebate will be determined by his total purchases of £3100, so that he will get rebate on the £2600 at the higher rate of 3 p.ct. instead of 2 p.ct.

A Piece of Coal.

A lecture, entitled "A Piece of Coal," was delivered last Friday evening by Mr. Samuel B. Chandler, of the South Suburban Gas Company, to the staff and employees of the Telephone Manufacturing Company, Ltd., at West Dulwich. The Works Manager (Mr. W. A. Jackson) occupied the chair; and Mr. Chandler had a large and appreciative audience. In the course of his lecture he dealt with the history of the introduction of gas for lighting purposes; the general process of gas manufacture and the plant used; bye-products, and the properties and uses of coke, oil, tar, ammonia, and benzole, &c. The lecturer had prepared a chart, which was exhibited, showing the composition of commercial gases—coal, blue water, carburetted water, mixed, and producer gas—and he explained their application for various uses. A short account was given of the war service of the gas industry, and the utilization of benzole and other products as high explosives. The introduction of the bunsen type of burner and its effect upon the application of gas for lighting and heating processes was dealt with, as well as illuminating and calorific standards of measurement, and the Gas Regulation Act. He explained the therm basis of charge, and the advantages accuring therefrom to consumers. A number of slides were shown illustrating gas-works plant and the application of gas as fuel for industrial, lighting, and power purposes.

GAS AND ELECTRICITY FOR INDUSTRIAL AND DOMESTIC PURPOSES.

A Discussion at Chelmsford.

Under the auspices of the Chelmsford Engineering Society (the President of which is Mr. Geoffrey F. Barrett, O.B.E.), there was last Thursday week an excellent discussion on the subject of "Gas and Electricity for Industrial and Domestic Purposes." It had been arranged that the openers of the debate should be, for gas, Mr. H. H. Creasey, of the British Commercial Gas Association; and for electricity, Mr. C. S. Buyers, of Messrs. Crompton & Co., Ltd., electrical engineers and contractors, of Chelmsford. Unfortunately, however, Mr. Creasey was indisposed. The paper which he had prepared for the occasion was therefore read by Mr. W. H. BECKET.

The opening paragraphs of the paper admitted that electricity will become more and more wonderful as the years go on, and that there is a huge field for the inventiveness of its experts; but the author could not agree that this field includes cooking, heating, and water heating, as gas is—and doubtless will remain—superior to electricity as a heat-producing agent. There are certain practical factors which govern the situation which all the imagination, and the efforts, of electricians cannot remove. Stress is frequently laid by electricians on the great improvements which are being, or will be, made in electric generation and appliances; but such claims always ignore the fact that the manufacture of gas and gas appliances will also improve—indeed, are continuously improving—and that electricity is not likely to make greater progress than gas. As a heating agent, it has less room for progress. More than thirty years ago, one was told gas was doomed. Electric light had appeared in Fleet Street and Regent Street. To-day, both are again lighted by gas. Whitehall, spoken of as the best-lighted thoroughfare in the world, is lighted by gas. The streets of Chelmsford were once lighted by electricity; but gas recently came into its own again, and the streets are now gas lighted.

About 1830, electricians were tentatively putting cookers and heaters on the market; and very shortly after, one began to see the statements that fumes from gas-cooking stoves and gas-fires were detrimental to health. Mr. Creasey does not like the sort of trade competition that runs on these lines. For many years past electricians have "done their damnedest" to gas in these ways, interspersed with the point put forward in a brilliant moment by an enthusiastic electrician that electric cooking, if it did not make a 3 lb. joint weigh 3½ lbs., certainly made it weigh more than a similar one cooked by gas. Now, the continuous efforts made in this direction for many years and the improvements in electric appliances of all kinds, if the electrician's case were a good one, should have resulted in the gas industry being either dead and done-for or at least on its last legs. Gas, however, is a very lively corpse. To prove this, he referred to the Gas Light and Coke Company; quoting the following three six-year periods during which electric competition has been very keen:

Six years from 1902–08 the output increased by 1741 million c.ft.
Six years from 1908–14 the output increased by 2813 million c.ft.
Six years from 1914–20 the output increased by 5178 million c.ft.

This showed a 44 p.ct. increase in eighteen years on a business a hundred years old. During this period, the apparatus installed—cookers, heaters, &c. (not including lighting)—increased by 803,000; and their output is still booming. Other London companies and those of other towns can tell much the same tale. If the supposed harmful effects of the use of gas appliances were really true, one would have expected the whole population of London to expire. On the contrary, with this enormous increase of the use of gas the health of London has steadily improved.

Referring to reliability and continuity of supply, the author mentioned that the Gas Light and Coke Company have maintained an unbroken supply through wars, strikes, &c., for over a century; and any serious breakdown of a town's gas supply is practically unknown. Press quotations were given to show how different is the case with electricity. Apart from the superior reliability of gas, it was admitted that gas lighting has in some cases to meet strong competition from electricity; though in others gas is still supreme. Tables were supplied showing the great advantages enjoyed by gas in the matter of cost. In Chelmsford, electricity costs 1s. per unit for lighting. The tables showed that, even at 10d. per unit, gas to provide only equal light would need to be charged for at the rate of 23s. 4d. to 51s. 8d. per 1000 c.ft., according to the type of burner and pressure, if in competition with tungsten lamps, or from 12s. 1d. to 26s. 8d. per 1000 c.ft. if in competition with half-watt lamps. But gas is only 5s. 7d. per 1000 c.ft., and electricity is 1s. per unit; and therefore electric lighting costs from two-and-a-half to nine times as much as gas.

POWER.

The paper contained the following section relating to power.

Competition between gas and electricity for power supply is very keen. Electricity frequently wins for small power units, or where space is so restricted that room cannot be spared for a gas-engine and shafting, and small motors are attached to each piece of machinery. It must be borne in mind, however, that by multiplying power units both capital charges and efficiency losses are greatly increased, and also that modern gas-engines take up only one-third of the space needed for the older patterns. There are also several types of vertical gas-engines available which occupy little space. In some special forms of power, gas does not compete—where machine and power units are contained in one piece of apparatus, for instance. For the larger, or very large units of power, and for constancy and reliability, however, gas is still supreme.

It is rather difficult to make a general comparison of running costs of gas and electric power, because figures vary under different conditions—such as amount of B.H.P. full and half load, &c.—but it is safe to say that, at the prevailing comparative prices, gas on the whole works out sufficiently cheaper to make it tempting to a customer either to instal or retain a gas-engine, rather than fix a motor. Occasionally

one gets cases where motors displace engines; but, on the other hand, the contrary sometimes happens.

Comparative Running Costs in the Gas Light and Coke Company's Area.

The gas consumed by modern gas-engines of standard make may be reckoned as from 12,000 B.Th.U. per B.H.P. per hour, for smaller sizes, to 9600 B.Th.U. for larger sizes—say 10,000 B.Th.U. as an average. Now 10,000 B.Th.U. at 1s. 1d. per therm equals 1·3d. per B.H.P.-hour. A therm equals 100,000 B.Th.U.; and 1s. 1d. per therm is equivalent to not quite 5s 2d. per 1000 c.ft. of gas of 475 B.Th.U. per c.ft. Less 10 p.ct. power discount, 10,000 B.Th.U. cost 1·17d. per B.H.P.-hour; or less 25 p.ct. for large consumptions, just under 1d.—0·975d. The minimum power charge for electricity in the Gas Light and Coke Company's area is 2d. per unit. In some districts it is dearer; but a comparison is made on the minimum price of 2d.

To produce 1 B.H.P.-hour theoretically needs 746 watts. Electric motor efficiencies, however, are variously quoted at from 80 to 85 p.ct. One B.H.P. hour, therefore, needs about 880 watts, which, at 2d. a unit, cost 1·76d. This cost of 1·76d. per B.H.P.-hour compares with something between 1·17d. and 0·975d. by gas, representing a saving of from 0·59d. to 0·78d. per B.H.P.-hour, or, assuming the load to be 20 B.H.P., a saving of 11 8d. to 15·6d. per hour. The comparative prices of gas and electricity in Chelmsford would probably work-out at about the same ratio.

In some cases where electric lighting displaces gas, customers are regained by installing gas-engines to generate the current. Many gas-driven generating sets are used in cinemas, large business establishments, and factories. A great saving in the cost of current can usually be effected by their installation in cinemas. The picture arc consumes a lot of current, at a specially low voltage. When current is obtained from a supply undertaking, it is therefore necessary to instal a motor generating set to transform the current to a lower voltage, whereby losses of from 20 to 30 p.ct. are incurred. This does not happen when current is generated on the premises at a suitable voltage. For a cinema of an average size, an 18 B.H.P. gas-engine is frequently installed, and the consumption of gas per unit generated costs about 2d.

Heating and Cooking.

For the provision of hot water, electricity is "not in the picture," as gas is infinitely more rapid, economical, and reliable. Gas-heated circulating boilers made in various patterns, and fixed either in conjunction with the ordinary hot-water storage or as a combination of boiler and storage in one, will provide sufficient water for an average hot bath in thirty to forty minutes, at a cost of 2d. to 2½d.; and for sink use for washing-up and cleaning purposes, a pail of very hot water in six to ten minutes, at a cost of 0·6d. The costs quoted are calculated with gas at 5s. 6d. per 1000 c.ft. Electricity has nothing to compare with such machines. The number of B.Th.U. electricity can provide for a given sum of money is always exceedingly low compared with that given by gas at the existing comparative prices. Taking Chelmsford, the price of gas is 5s. 7d. per 1000 c.ft., or 14·9 c.ft. for 1d. The calorific value is 475 B.Th.U. per cubic foot. We therefore get 14·9 times 475 for 1d. = 7077 B.Th.U for 1d. Electricity for heating in Chelmsford varies in price from 4½d. to 2½d. per unit. At 4½d. per unit of 3420 B.Th.U., to get 7077 B.Th.U. would cost 9½d.; at 2½d., it would cost 4¾d. At the highest price for electricity, the cost is 9½ times as great as gas; at the lowest, 4¾ times. To reduce the appalling difference in cost, greatly superior efficiencies are frequently claimed for electric apparatus over gas. There is really very little justification for these claims; and as regards water heating, there is none. But suppose we reduce current costs by 25 p.ct., which is more than generous, even then for cooking, heating, and water heating electricity is three-and-a-half to seven times as costly as gas.

As to heat for other purposes than cooking and water heating, in Mr. Creasey's view gas is practically supreme in the industrial field: (1) Because it is much cheaper and more reliable; and (2) because flame and flame-contact plays such a large part in most processes. Maintenance costs are always much lower for gas than for electrical apparatus. In the matter of warming rooms, where there are no flues in small rooms, and where expense is no obstacle, electricity has a small chance; but in the vast majority of cases, gas is supreme. For economy in installation, running, and maintenance costs, for appearance and ventilating effect, gas is vastly superior to electricity for heating rooms. To get 100 p.ct. efficiency, which electricians always claim and badly need, radiators must not be fixed in fireplaces unless the flues are blocked-up; otherwise some of the all too costly heat would go up the chimney. This is unhygienic, yet electricians have the audacity to claim that electric radiators are more hygienic than gas-fires. The contrary is the case. Electricians cannot have it both ways. Either they do not get—and therefore must not claim—100 p.ct. efficiency or else they kill both the normal ventilation of the chimney and the additional effect of the heat therefrom so necessary in the winter. Even allowing electricity 100 p.ct. efficiency, however, gas can always beat it on cost. Imitation is the sincerest form of flattery. The gas industry advocated a reduction in size of flues in modern houses to a capacity suitable for the removal of the products of combustion from gas-fires, *plus* a ventilating effect. The "built-in" gas-fire system, with economy flues, providing a greater floor space and reduced building costs, is spreading so rapidly that electricians are—not for the first time—imitating gas, and trying to "steal its thunder," by claiming that even greater economies can be effected by electric heating, as no flues are necessary. This principle is unsound, as without some induced system of ventilation flues are absolutely necessary. A small-size "built-in" gas-fire, fitted to an economy flue, was recently tested for ventilating effect, and proved to create one air change per hour over and above the normal, carrying off about 1200 c.ft. of air per hour.

With regard to cooking, gas is unquestionably still supreme. Electricity for that purpose is dear to instal, to use, and to maintain, and unsatisfactory in results. A point against electric cookers not generally known is that they are more or less unmarketable, and that if a user decides to give them up he has great difficulty in selling them. Gas-cookers fixed in one town can readily be sold for use in any other. Maintenance costs of gas-cooking apparatus are very low compared with electric appliances. This is quite understandable, as gas-burners last many years; while electric elements have to be renewed fairly frequently. A catalogue of electric cookers quotes £18 as the price of a small cooker, which compares with a gas-cooker of about the same size, but of superior capacity, costing only £6.

Though gas is still supreme in most of the fields in which it meets with electric competition, there is plenty of room for both. Electricians should face facts, and give-up competing against gas in certain unprofitable directions. They should concentrate instead on profitable business, and realize that gas is a worthy competitor—instead of making more or less acrimonious attacks upon it.

TAXING IMPORTED ILLUMINATING GLASSWARE.

Applications Under the Safeguarding of Industries Act.

The Committee who have been appointed under Part II. of the Safeguarding of Industries Act to investigate a complaint with regard to illuminating glassware, further discussed the matter in relation to the gas industry on Wednesday last. A report of the earlier proceedings was given in the "JOURNAL" last week (p. 104).

Mr. *S. S. Ogilvie*, Joint Manager of the National Gas Council, attended to give further particulars. He handed-in certificates and copies of resolutions passed with regard to the policy adopted by the Council that the free importation of heat-resisting glass and gas-mantles was essential to the interests of the gas industry. The documents handed-in included a list of the members of the Council and their elected representatives, a copy of the constitution, and a list of the members of the Executive Board. Dealing with the questions raised on the last occasion as to how far the Central Executive Board had dealt with the matter upon which evidence had been given, it was explained that the first resolution was passed on Jan. 11, 1921.

The CHAIRMAN asked for a list of those present on that occasion, as he wished to be quite sure that there were representatives of the great corporations present.

Witness said he could assure the Committee that the large municipal corporations were well represented—and always were—at the meetings of the Central Executive Board. On April 13, 1921, a letter was received suggesting that action with regard to the Safeguarding of Industries Act should be postponed; but on that day a further resolution was passed that the previous resolution should stand, and that action be taken accordingly. Finally, at the last meeting of the Central Executive Board (on Jan. 10, 1922), a further resolution was passed to the effect that the Board approved the action which he (Mr. Ogilvie) had taken, and giving him authority to inform the Committee to this effect. With regard to the circular-letter mentioned on the last occasion, asking for the views of the various members of the Council, he had received one more reply against the policy suggested in the resolution of January, 1921—viz., from the Derby Gas Company—making three in all. The question had been raised as to how far the members of the Council were aware of the action which the Central Executive Board had taken. The monthly report for Feb. 28, 1921, contained a statement on the lines of the evidence he had already given, after the members had been informed of the resolution passed in January, 1921. Later (on April 30, 1921) a circular-letter was sent to all the members asking them to get their parliamentary representatives to support the action of the Government in not putting heat-resisting glass and gas-mantles in the schedule under Part I. of the Act. Then, as to the position of the Council in regard to the industry and its authority to act as the mouthpiece of the gas industry, he mentioned the many occasions on which the Council had been consulted by Government Departments, and contended that this was sufficient to prove that the Council were the accepted mouthpiece of the industry. As to the views of the large municipal corporations, upon which the Chairman had put several questions, it was mentioned that Mr. A. W. Smith, the General Manager and Secretary of the Birmingham Corporation Gas Department, had sent a letter to the London Chamber of Commerce urging action on the lines of that now being taken by the Council; and a resolution to this effect was to be passed by the Birmingham Gas Committee that day, and would be forwarded to the Committee. Witness handed to the Committee figures of the percentages of glass used in the gas industry which was imported and manufactured in this country.

At the conclusion of this supplementary evidence,

Sir JOHN BARRAN (a member of the Committee) said he would like to disabuse Mr. Ogilvie's mind of any notion that his evidence fell under suspicion last time. The Committee were anxious to get quite fairly and exactly the grounds of the support on which the National Gas Council were proceeding in this matter, and they wanted to be quite sure that it represented the bulk of their members.

Mr. *F. Watkinson* (Director of Messrs. J. & W. B. Smith, Ltd.) said he desired to oppose the application for a tax on illuminating glassware from Germany and Czecho-Slovakia. In his judgment, the complainants had no ground on which to complain of unfair competition from these countries due to depreciated exchange. He further alleged that the prices which had been given to the Committee as those at which these imported goods were being offered here did not bear examination. The complainants had quoted to the Committee, for instance, that clear balloons were being sold at 1s. 3d. per dozen, and half opals at 3s. His firm were very large importers from Bohemia and Germany; but he knew of no firm who could supply at these prices, free Hamburg or anywhere else. The best quotation he had obtained for clear balloons was 20s. per gross Hamburg, or about 25s. 6d. delivered to his warehouse; and he challenged anyone on the other side to prove that these were being sold here at the prices they had named. The same comments applied to opal bowls. It was a fact that many bowls for indirect lighting could not be made here. There was a certain trade in this country in alabaster bowls; but the supply of materials, which came from Derbyshire, was controlled by a few British firms. There was only a limited sale for them in respect of very high-class fittings. He was sorry to say that the

quality of such British glass as was made here for illuminating purposes was very poor—indeed, he went so far as to say that British manufacturers were hopelessly inefficient in their methods. Abroad, a great deal of tank glass was made which was cheaper than the pot glass so largely made here. British illuminating glassware was made of lead metal, which was better so far as the glass itself was concerned; but the finish was not so good as, and was higher in price than, the Bohemian article. Speaking of the increase in the price of Bohemian glassware, witness mentioned that Czecho-Slovakian flint mono globes were 3s. 6d. per doz., and coloured 5s. per doz. delivered London; but to-day they were 9s. 6d. and 13s. per doz. respectively. In the same way flint etched globes were 6s. and coloured 7s. 6d. per doz. delivered London pre-war; to-day they were 14s. 6d. and 17s. 6d. per doz. respectively, free Hamburg. This represented an advance of 200 p.ct. and 150 p.ct., when freight was added, on these two different lines, which was a greater increase than had taken place in the British article. Therefore, it could not be alleged that the depreciated mark was the reason for the cheaper Bohemian price. The fact was that as the crown or mark fell, so wages had had to be advanced from time to time. Coal was cheaper; but, on the other hand, the foreign makers had to get some of their raw materials from abroad. The reason, in his opinion, for the cheaper article from abroad was that the Germans and Bohemians had laid themselves out for glass manufacture in a way that we had not. It was impossible to get British makers to complete orders in a reasonable time; and he gave several instances of this.

Several members of the Committee pointed out that some of the orders were given during the war, when it was obviously difficult to complete them quickly.

Witness agreed; but pointed to orders given since the armistice which had not yet been completed. Dealing with the effects of the proposed duty, he said that it would mean that the working-class population would have to pay more for their glass, as they were the largest users of gas for lighting, and would therefore be hit harder than any other part of the community. The tax, on the other hand, might provide a little more work for the much smaller community represented by the glass maker. But the English makers could never supply, even with a tax, in competition with the German or Czecho-Slovakian, for the reasons he had given. Another effect of the tax would be that the export orders now handled by British houses would be placed direct with the foreign manufacturers, because even in Australia and New Zealand they would not have British glass on account of its high price and poor quality. The orders received specified Czecho-Slovakian glass. Therefore, there would not only be a loss to the British wholesale houses here, but also to British shipping, as the goods would go *viâ* Antwerp or Hamburg.

Answering the CHAIRMAN, witness promised to provide the Committee with invoices showing the prices which he himself had recently paid for Bohemian illuminating glassware.

A large number of samples of illuminating glassware for incandescent gas lighting were placed before the Committee; and the particular details in which the British article fell short of the quality of the foreign article were pointed out.

Witness went on to say he would be only too pleased to buy British glassware if he could get it at the right quality and price. There were one or two special lines for which there was a very small sale, which were of a high-class special to the British maker for the best quality fittings; and he always kept a small stock of these. He agreed that his orders to British makers were comparatively small ones—about £150 or £200.

Considerable stress was laid, by the Committee, on the question whether goods coming from abroad are quoted in sterling or marks; and reference was made to a letter from the German Embassy indicating that the German Government had issued a regulation stating that all quotations for export goods were to be made on the basis of the mark at 280 to the £. There seemed some confusion as to whether this regulation had actually been put in force; and none of the witnesses who came before the Committee subsequently, on other aspects of the matter, was able to say what the position was. One witness suggested that if the regulation had really been made, it was being evaded by the German exporter.

Further evidence was subsequently given on behalf of the London Chamber of Commerce, but not in respect to illuminating glassware.

Sir ARTHUR COLEFAX, K.C., then addressed the Committee in regard to the case for the opposition. At the same time, he expressed a desire to hear all the evidence the Committee were to have.

The CHAIRMAN asked Sir Arthur to address the Committee now, and to make any further remarks later if he desired.

Sir ARTHUR COLEFAX said that the present position was very much complicated by the fact that the Committee had a large amount of information which had been given to them confidentially, and which he could not refer to. The question the Committee had to deal with was limited to that referred to in section 2, sub-section 1 (*a*) of the Safeguarding of Industries Act—viz., whether, by reason of the depreciated exchange, goods were coming into this country at prices below those at which we could profitably manufacture here. He submitted that, with regard to illuminating glassware or the other forms of glassware included in the complaint, there was no evidence whatever of this. Moreover, the Committee had to satisfy themselves that there was a home production; and on this point his submission was that there was very little home production, and that the foreign article supplied a large demand here which the home producers could not, and did not, satisfy. There was no evidence, for instance, that Messrs. Chance Bros. did any trade in heat-resisting glassware except the ware used for outside lighting mainly in London; and of that it was admitted they had got practically all the trade. In the smaller branches—such as those used for indoor incandescent lighting—they had none of the trade, and there was no evidence that they ever did have it. It was a question of safeguarding an existing British industry; but there was no evidence that such an industry existed. As to Mr. Ogilvie's evidence, he thought there could be no question that the National Gas Council was the recognized mouthpiece of the gas industry; and from his evidence it was clear that a tax on illuminating glass would do considerable damage to the gas industry. All the evidence was that the cost of the imported article had gone up in a greater ratio than the British, compared with pre-war, where the British article could be compared; so that it was not right to say that the lower price charged by the foreign makers was due to the depreciated exchange. He again reminded the Committee that they had to be satisfied that it was on account of the depreciated exchange that the foreign goods were cheaper. He contended that the case he had put before the Committee did not conflict with British employment, because the demands of the country were not satisfied by the British makers, inasmuch as they did not cater for the bulk of the foreign illuminating and other glassware which came into the country, but had a specialized high-class trade of their own, with which the imported goods did not compete.

The Committee then adjourned.

STEAM RAISING AND COAL CONSERVATION.

A paper recently read by Mr. David Brownlie, F.C.S., of Manchester, on "Boiler-House Management," before the South Wales Institute of Engineers at Cardiff, has greatly stimulated local interest in the subject; and among the views it has called forth are those of Mr. J. William Burr, the Borough Electrical Engineer of Swansea.

Mr. Burr points out that the interim report of the Coal Conservation Sub-Committee, published in 1918, stated that the consumption of coal involved in the production of motive power in the United Kingdom amounted to 80,000,000 tons per annum, and that if the power supplied were dealt with on comprehensive lines, and advantage taken of the most modern engineering developments, the saving in coal consumption throughout the country would be enormous. To effect this saving, it would be necessary to erect super-plants on suitable sites, and feed into a main trunk distribution system; and Mr. Burr is of opinion that it will be some years before these conditions obtain. While he does not think it possible to save as much by any other means than that suggested by the Sub-Committee, he believes much can be done in this direction by modernizing and carefully supervising existing plants. The present consumption for the country as a whole is taken as 5 lbs. of coal per horse-power-hour. He claims it should not be difficult to reduce this figure to half, provided that we have better coal selection, complete equipment with all instruments and apparatus for controlling combustion, and perfect supervision of the engine-room and boiler-house. It is useless, he says, to instal instruments unless men are trained to record their indications in the proper way. In America, a special course in fuel technology and practicable firing are arranged for the men intended for this work. The pay for firemen is higher than in this country; and the trained men have a better status than the ordinary mechanic or engine driver. Mr. Burr declares that it should not be difficult for properly trained men, under the supervision of an efficient engineer, to effect a saving in coal consumption amounting to 50 p.ct. at most works. He gives an instance of a total saving effected without any new plant at a large power station at the rate of £22,000 per annum—42 p.ct. of the coal bill. As regards commercial training for engineers, Mr. Burr is a strong believer in this, and considers that, if engineers are to fill the positions which are really theirs, they must receive a proper business training.

Reduction at Armagh.—The price of gas in Armagh has been reduced from 8s. 4d. to 7s. 6d. per 1000 c.ft.

Sevenoaks Gas Company Reduce their Price.—The Sevenoaks Gas Company announce a reduction, as from the 1st inst., of 3d. per 1000 c.ft. in the price of gas.

Additional Cost of Gas Testing at Sheffield.—Mr. Watkins, calling the attention of the Sheffield City Council to the fact that the Gas Examiner was to be appointed at a salary of £600 per annum, against £120 at present, asked what additional duties were being cast upon him. Mr. Blanchard replied that the Act of 1921 imposed upon the Corporation more extensive and elaborate tests of the gas, for the protection of consumers.

Coleraine Gas-Workers' Strike.—A strike of gas-workers in Coleraine, on a question of wage reduction, led to a failure of the supply of gas; and for two or three nights the town was in darkness, while industries were greatly hampered, and general inconvenience resulted. On Sunday, Jan. 8, evening services were dispensed with in all the churches, with one exception. The Urban Council considered the matter; and, after negotiation with the men, the dispute was settled on the basis of a reduction of 1s. 3d. per week on Feb. 1, and a similar reduction on April 1. The original proposal was for a 12½ p.ct. reduction forthwith.

Indications of Coal-Gas Poisoning.—An inquest was held at Birmingham on Tuesday of last week concerning the death of William Westwood, a master baker, who got up early in the night to attend to his work in the bakehouse, and an hour later was found lying dead in a trough. There was a lighted candle in the room; and in the trough was a gas-ring used for boiling water to produce steam, in connection with the making of buns. A doctor attributed death to asphyxia, due to coal-gas poisoning. Westwood's son told the doctor that the gas-ring was not turned-on, and that the tubing used in connection with it was hanging in the trough. The son said the ring and tube were in the bottom of the trough; and he thought the gas was lighted. Several persons stated there was no smell of gas. The doctor said the pink discolouration of the skin and the cherry colour of the blood were characteristic of gas poisoning; but there were natural conditions in regard to the man's organs that made him liable to sudden death. The Coroner said the appearances as deposed by the doctor as characteristic of gas poisoning could not be ignored; but there was nothing to show how the man got the gas. He found that Westwood died from gas poisoning while suffering from an enlarged thymus gland and defective pulmonary valves.

STRETFORD COUNCIL AND THE GAS UNDERTAKING.

A report has been adopted by the Stretford Urban District Council for circulation among the ratepayers, relating to the proposed acquisition of the Stretford gas undertaking. The report is signed by the Chairmen of the six Urban and Rural District Councils concerned, and is submitted as a justification of the case for local control as against control by the Manchester Corporation. The particulars given are based, it is stated, upon an impartial consideration of the case, and upon the expert advice of Mr. Isaac Carr, of Widnes, "who to-day is producing the cheapest gas in the world."

The report states that the Joint Authorities have examined the books and working of the Stretford gas undertaking; and from their information they can corroborate the Chairman of the Manchester Gas Committee and his Consulting Engineer, when they say that the price paid for the Stretford undertaking (£300,000) was "the lowest price obtained for gas undertakings transferred to local authorities during the last seventy years." The Stretford Gas Company's area comprises 13,359 acres, with a population of 66,044, and a rateable value of £635,921. The gas consumption is 500 million c.ft. per annum; and the ratepayers are reminded that "the increasing possibilities of the undertaking would constitute an immense advantage to the Manchester Corporation." The increase in gas consumption in Manchester, it is noted, has been only 3 p.ct. for the past twelve years; while the increase in the Stretford Gas Company's area has been 43 p.ct.

It is further pointed out that before 1914 the Stretford Gas Company supplied gas as cheaply as, and occasionally more cheaply than, the Manchester Corporation. It was only with the dislocation of the war that the Stretford price exceeded Manchester's. On the occasion of the opposition to the Manchester Corporation Bill, the Joint Authorities complain that they had no opportunity of testing the working costs of the Stretford gas undertaking. They have since considered the matter in detail; and while they have found that the purchase price was a reasonable one, they are astonished that the working costs of the undertaking were so high when compared with similar undertakings. "If the Joint Board purchases," says the report, "the capital will be approximately £310,000. This sum will be raised by the Joint Board. It will not be specifically debited against any individual authority. The annual charges, £20,142 (interest and sinking fund), will be a charge against the undertaking. In other words, the ratepayers may be assured that the raising of this sum will not mean an extra charge upon the rates. Dividends, interest, and Directors' fees amount to £10,920 per annum. Therefore the Joint Board would require to meet an extra sum of (say) £9222, which would mean an increase of 4·6d. per 1000 c.ft. on present sales of gas. This extra cost of 4 6d. involved by public purchase would be more than met by economies equivalent to 16d. per 1000 c.ft.

The report goes on: "It should be stated, however, that, apart from the fact that the plant and mains capacity is equal to a further increase of 25 p.ct. in the output of gas with very little outlay, the engineers are of opinion that, had the works been owned by the Joint Board on Jan. 1, 1922, further economies could have been effected, . . . or, in other words, the Joint Board can definitely state that these economies will enable them to reduce the price of gas 8d. per 1000 c.ft. (the same price as Manchester), and in addition pay the extra interest and sinking fund charges, and compensate for the loss of revenue due to the abolition of cooker-rents and reduction of gas-fire rents. The ratepayers will therefore note that the promise of the Manchester Corporation to reduce the price of gas in the Stretford Company's area, equivalent to the price within the city, is only what could have been done by the Joint Board had they been in possession of the works from Jan. 1, 1922."

Detailed figures are given to show that, unlike electricity undertakings, where large units of plant are productive of low costs of manufacture, large gas undertakings do not necessarily produce lower costs than medium-sized undertakings. The report urges that it would be distinctly wrong for the Manchester Corporation to claim that their reduction of prices is due to their temporary possession of the undertaking. The reduction in the price of coal and the normal reduction of other charges are referred to; and there is a statement of economies in repairs, cost of distribution, &c., which may reasonably be anticipated in the future. "Out of the total saving of 16d. referred to, there will be loss of revenue and additional charges amounting to £26,722, or 12·83d. per 1000 c.ft. This is accounted for by 1·25d. loss of income by supplying cookers free and reducing gas-fire rents; 7·15d. reduction in price of gas to present-day Manchester prices, domestic and industrial; and 4·43d. additional interest and sinking fund required on capital, 35 years' repayment at 5½ p.ct. It will be observed, therefore, that the saving in cost of manufacture in 1922 will be more than sufficient to meet the loss of income and extra charges set forth, including the reduction of 8d. in the price of gas to the net price ruling in Manchester; and, further, that only 12·83d. of the 16d. is appropriated, leaving a balance of 3d."

Finally, the report refers to the serious detriment suffered by the Company due to the restrictive field of coal supply, owing to lack of railway facilities, which has also involved the present expensive system of coal handling. "After careful investigation, the Joint Authorities have solved this serious disadvantage, as it has been arranged for a siding to be constructed, and other arrangements made that will effect a saving of £10,000 per annum, due to reduced costs by improved coal buying, transport, and handling." These economies, it is estimated, will be equivalent to 8d. per 1000 c.ft. of gas, and will assure a further reduction in the price of gas beyond those mentioned, when the Joint Board are in a position to direct the undertaking.

At Leeds Police Court, on Thursday last, there were 119 summonses against defendants for non-payment of gas and water accounts to the Corporation; the amounts ranging from 10s. to £25. Many of the defendants were coal miners out of employment. Orders were in most cases made for the payment of instalments; and in others the Court allowed indefinite adjournments.

NOTTINGHAM GAS CHARGES.

There was considerable criticism at a meeting of the Nottingham City Council on Monday of last week, regarding a proposal of the Gas Committee that authority should be given for an application to the Board of Trade for an order to substitute thermal units for cubic feet. Mr. H. G. Ford (the Vice-Chairman of the Committee) explained the matter, and Alderman H. Bowles (the Deputy Mayor) then asked that further consideration of the report should be deferred until the next meeting, and proposed an amendment to this effect, which was seconded by Mr. A. Judd. Alderman E. Huntsman observed that Mr. Ford had omitted one thing. He had carefully refrained from stating what was the object in bringing the report forward. Alderman T. Ward said that what the Council wanted to know was the relative value to the public. Alderman E. L. Manning added it was important that information should be forthcoming as to what the effect upon the consumer was going to be in regard to lighting power. In the low-lying districts of the city, consumers were complaining very much about the quality of the gas. Mr. A. R. Atkey, M.P., thought the Council would realize that some difference in the method of charging must take place, if the Gas Committee were to remain in existence. In view of the desire for further information, Mr. Ford expressed his willingness to take the report back, and to evolve something which would make the matter clear; and this course was adopted.

STOKE-ON-TRENT GAS BILL TO GO FORWARD.

The Potteries Station Purchase.

Evidence of the apathy of the electors towards important municipal schemes was to be found in the fact that not more than 25 people attended a public meeting held in the Victoria Hall, Hanley, on Thursday week, to consider the desirability of promoting the Stoke-on-Trent Corporation (Gas Consolidation) Bill in the next session of Parliament.

The purchase involves a total sum of £400,000, of which £100,000 will be paid in cash, and £245,000 in Corporation stock to be issued to the Company. The total capital of the amalgamated undertakings, when the necessary improvements have been made, will be £1,000,000; and it is intended to centralize the manufacture of gas and of by-products at the Company's works at Etruria, as the policy of centralization is gradually carried into effect.

The DEPUTY-MAYOR (Mr. Sampson Walker) moved: "That this meeting of the electors of the county borough of Stoke-on-Trent are in favour of the promotion by the Council of the borough in the ensuing session of Parliament of the Bill now submitted to them." He said that some time ago a crisis arose in regard to the lighting of the district; the Corporation being face to face with an expenditure of many thousands of pounds in order to supply the demands of their customers. It came to the knowledge of the Council that the British Gaslight Company were willing to dispose of their undertaking, and the Corporation very wisely decided, before spending a very large sum on extending and bringing up-to-date their own properties, to approach the Company with a view to acquiring their undertaking. The Corporation now sought legal powers to purchase the Company's undertaking, to unify the production of gas in the borough, and to make provision for possible developments for the purpose of supplying gas to the people of North Staffordshire. The Council were almost unanimously of opinion that the price agreed upon was the lowest at which the Company's undertaking could be bought, and that it was such as would enable the Corporation to make the undertaking a profitable and successful concern.

Alderman BROOKHOUSE (Chairman of the Gas Committee), in seconding the resolution, said that, in reference to the crisis which arose owing to the need for spending money on the municipal gas undertakings, he wished to say that the British Gaslight Company were also compelled to begin to spend heavily on their undertaking. He thought the meeting would see the wisdom of the effort made by the Council to come to an understanding with the Company and to centralize the gas undertakings of the area for the purpose of giving a fuller and more complete service to the community. If this Bill did not go through, the Corporation would have to commence to spend this year a very large sum of money on their present undertakings—immediately at Fenton and Stoke in order to meet next winter's demand. The British Gaslight Company had met the Corporation in a very fair, frank, and open manner. The scheme proposed by the Corporation was absolutely essential in the interests of the trade of the Potteries. The Corporation had large demands for gas for the industry by which most of the community lived; but at present those demands could not be met.

Questions were invited, but none was asked; and the resolution was put and carried.

Big Purifier Installation for Toronto.—Messrs. Ashmore, Benson, Pease, & Co., Ltd., of Stockton-on-Tees, have just received an order by cable from the Consumers' Gas Company of Toronto for a very large purifier installation. The contract has been awarded to them in the face of very keen American competition.

The Public Disturbance in Calcutta.—Reference to the public lighting was made at the December meeting of the Calcutta Municipal Council, when a member asked the reasons for the non-lighting of certain gas-lamps on the 17th of November and the following day, and also "what punishment (if any) had been inflicted on the offenders or persons responsible for the non-lighting of the lamps." The Chairman replied that, owing to the public disturbance in Calcutta on the 17th of November, the employees of the Gas Company refused to work, and the manufacture of gas had to be entirely stopped for one day. This seriously dislocated the public lighting; and it was necessary to curtail street lighting for three days.

GAS DEPARTMENT MAINTENANCE WORKERS' WAGES AT MANCHESTER.

A number of workers' organizations and the Manchester Corporation were the parties in a recent appeal to the Industrial Court against reductions of wages. The terms of reference were to decide as to whether or not (among other things) the Corporation were justified in reducing the wages of the skilled engineers in the Tramways and Gas Departments by 2d. per hour, with power to the Arbitrator, should he be of opinion that a lesser reduction ought to have been made, to decide what the amount should be. The decision of the Court was that the Corporation were justified in making the reduction appealed against. In setting out the facts, they state that the men received the general war advances and bonus of the engineering trade. Their rates, after the reduction of 2d. per hour, are 74s. 6d. per week for fitters and turners; this amount including 33s. 6d. per week war advances, and being subject, until Jan. 1, 1922, to the addition of the remaining portion of the 12½ p.ct. bonus. The corresponding engineering district rate is 72s. 6d. for fitters and turners. The amounts now in dispute were granted as advances to the workpeople concerned as from May 1, 1920, in the Tramways Department, and as from Oct. 20, 1920, in the Gas Department. The Corporation submitted that the advances in question were really temporary advances granted upon the implied condition that they should cease to have effect as independent advances when a general advance in the engineering trade was granted at the periodical hearing before the Industrial Court in June, 1920. The Unions concerned urged grounds for retaining the advance, which the Court were of opinion raised questions of a general or national, rather than of an especially local, character, and did not meet the circumstances in which the advance was given.

SOUTHPORT GAS CHARGES.

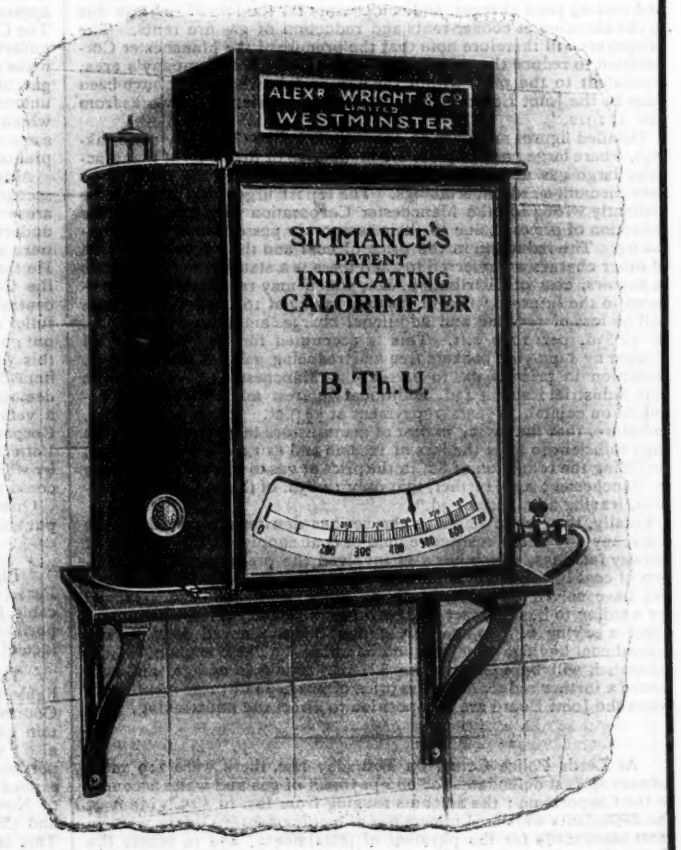
The Chairman of the Gas Committee (Mr. Wright) referred, at the last meeting of the Southport Town Council, to the Gas Engineer's report giving reasons why the gas should not be reduced in price from 5s. per 1000 c.ft. until after the close of the financial year. The Committee, he said, had very carefully considered this report; and they supported it. He alluded to other features of the report, and said they could not find a town of similar size or larger that had contributed half the amount (£56,400) in relief of rates during the war. When called upon to contribute something in war materials, Southport did its share. No gas engineer in the country did more than Mr John Bond in this respect. In comparing towns, these things should be taken into account. Yet when the consumers—and some members of the Council as well—saw in the newspapers reports of one or two decisions to reduce the price of gas, they at once exclaimed "Why cannot Southport do the same?" Since he had heard such remarks, he had made careful inquiries up and down the country into what had been done; and he had confidence in saying that, for every town that had reduced the price of gas, thirty had not, and would not do so until the end of the financial year. During the thirteen weeks of the coal strike, the cost of gas to the Gas Committee was 7s. 4d. per 1000 c.ft. Consumers were getting it practically at 4s. 9d.; and thus there was a loss of 2s. 7d. on every 1000 c.ft. Shopkeepers would have charged the full cost to consumers. The minutes and recommendation not to decrease the charge of gas were carried without further comment.

COKE-BURNING "SENTINEL" WAGONS.

In some notes on "Smoke and its Prevention," a writer in the "Sentinel Transport News" points out that smoke may be prevented from forming if each particle of gas, as it is made by distillation from the coal being consumed, is immediately mixed thoroughly with hot air; and that, even if smoke is formed by the absence of conditions for preventing it, it may afterwards be burned if it is thoroughly mixed with air at a sufficiently high temperature. It is easy to burn smoke when it is made in small quantities; but when made in great volumes, it is difficult to get the hot air mixed with it unless special apparatus is used. In order to obtain the conditions for preventing smoke, it is necessary: (1) That the coal be delivered into the furnace in small quantities at a time; (2) that the draught be sufficient to carry enough air into the furnace to burn the gases as fast as they are distilled; (3) that the air itself be thoroughly heated either by passing through a bed of white-hot coke or by passing through channels in hot brickwork, or by contact with hot firebrick surfaces; (4) that the gas and air be brought into the most complete and intimate mixture, so that each particle of carbon in the gas meets, before it escapes from the furnace, its necessary supply of air; and (5) that the flame produced by the burning shall be completely extinguished by the burning of every particle of the carbon into invisible carbon dioxide. Anthracite, which works excellently and smokelessly in many fixed boiler plants, does not, as a general rule, give satisfactory service on the road.

The best remedy of all, however, is to use coke. Coke is the residuum obtained after coal has been submitted to a distillation process whereby all volatile hydrocarbons and tarry matters have been removed. Since these are the cause of smoke, coke obviously can give none. The ultimate heating value of coke is, it is true, not so great as that of coal, provided that all the volatile matters in the coal are burnt completely to carbon dioxide. But, in any case, where smoky combustion tends to take place readily—such as in the small boiler plants attached to steam vehicles—coke compares very favourably with coal in heating value, and has the advantage that it can be completely consumed in such plants, and that the user is not paying for combustible matter he cannot utilize. In order to burn coke, however, a roomy firebox is necessary, coupled with careful design of the boiler. It is because the "Sentinel" wagon was intended from the first as a coke-burning vehicle, and has been designed accordingly, that it has achieved such enormous success and popularity in the use of this fuel.

CALORIFIC POWER AT A GLANCE.



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APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Jan. 11.]

Nos. 1 to 586.

BOURDON, A. V. A.—"Gas-burner for domestic use. No. 227.
BOYS, C. V.—"Calorimeters." No. 194.
BROCKWAY, F. G.—"Gas-washers, &c." No. 218.
BURTON, A. H.—"Fire or gas heater and hot-air distributor." No. 11.
CORTHESY, J. H.—"Distillation of liquid hydrocarbons, &c." No. 323.
DICKSON, W. K. L.—See Corthesy, J. H. No. 323.
DOUGLAS, R. P.—"Manufacture of sulphate of ammonia." No. 441.
GEORGE, S. E.—"Gas or air tight door for furnaces." No. 107.
GINGER, H.—"Gas-burners." No. 419.
HARBORD, F. W.—"Manufacture of coke." No. 536.
HOLMES, R.—"Gas collectors or retorts." No. 373.
JOANNES, G.—"Thermal indicating apparatus." No. 190.
KOTCHMANN, W.—"Combustible mixture for generating gases under pressure." No. 579.
LANCASTER, E. W.—"Anti-vibration devices for gas-mantles, &c." No. 385.
MIDDLETON, H.—"Gas-ovens, gas-fires, &c." No. 239.
MOTT, F. J.—"Gas, &c., controlling and igniting devices." No. 575.
PRIDEAUX, C. B.—"Gas fire-lighter." No. 38.
SANDY, W. J. L.—See Middleton, H. No. 239.
SCHMIDT, O.—"Packing for pipe-joints." No. 259.
SIEMENS AND HALSKE AKT.-GES.—"Measuring flow velocity of gases in flues of furnace, &c." No. 487.
SNELL, A. C.—"Gas-fires." No. 366.
SULZER FRÈRES SOC. ANON.—"Apparatus for conveying and discharging incandescent coke into cooling chambers." No. 45.
SULZER FRÈRES SOC. ANON.—"Apparatus for cooling incandescent coke." No. 46.
SULZER FRÈRES SOC. ANON.—"Cooling incandescent coke and simultaneously obtaining water gas therefrom." No. 47.
TRADE, SECRETARY OF THE BOARD OF.—See Boys, C. V. No. 194.
UMPLEBY, F.—"Gas-generators." No. 216.

RESTORATION OF LAPSED PATENT.

Notice is given that an order was made on Jan. 5 restoring patent No. 9302 of 1914, granted to William Brown Davidson and Alfred John Liversedge, for "Apparatus for washing gases and for analogous purposes."

At Chepstow, John Fletcher, fitter, pleaded guilty to attempting to defraud the Caldicot Gas Company, by whom he was formerly employed, by tampering with a meter. He was fined £2.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Jan.* 16.

There are inquiries on the London market for pitch for export; and it is understood that makers, being already well sold, are firm at the last price. Creosote is steady at 6½d. to 7d. per gallon in bulk.

Other products are without change.

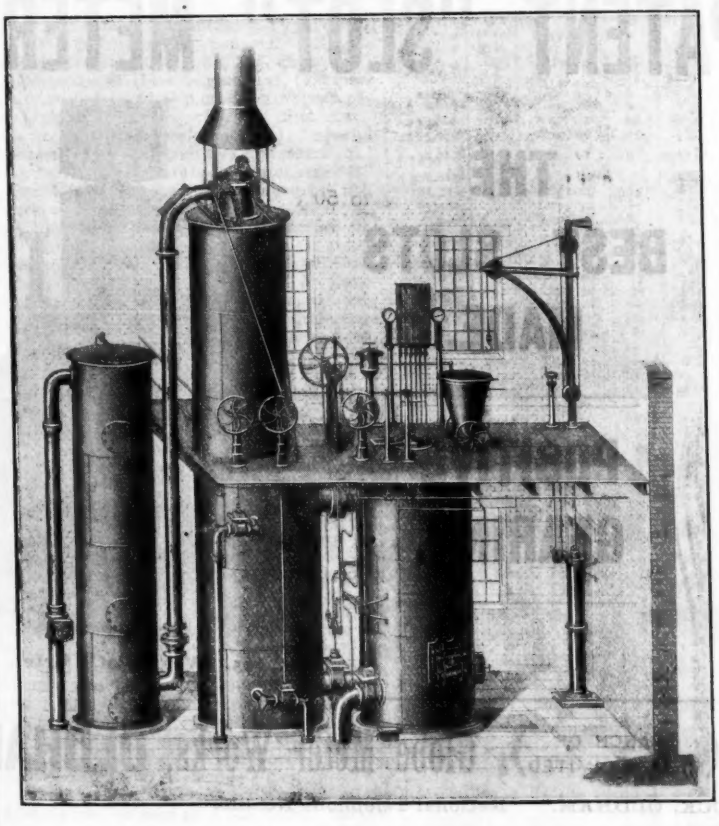
Tar Products in the Provinces.

Jan. 16.

The average values for gas-works products during last week were: Gas-works coal tar, 35s. 9d. to 40s. 9d. Pitch, East Coast, 52s. 6d. to 55s. f.a.s. and 57s. 6d. to 60s. f.o.b.; West Coast—Manchester, 50s. to 52s. 6d.; Liverpool, 50s. to 52s. 6d.; Clyde, 52s. 6d. to 55s. Benzole 90 p.ct. North, 2s. 2d. to 2s. 3d.; crude 65 p.ct. at 120° C., 1s. 9d. to 1s. 10d. naked at makers' works; 50-90 p.ct., naked, North, 2s. 2d. to 2s. 3d. Toluole, naked, North, 2s. 8d. to 2s. 10d. nominal. Coal tar crude naphtha in bulk, North, 10d. to 11d. Solvent naphtha, naked, North, 2s. 2d. to 2s. 5d. Heavy naphtha, North, 2s. 2d. to 2s. 6d. Creosote, in bulk, North, liquid, 5½d. to 5⅝d.; salty, 5d. to 5¼d. Heavy oils, in bulk, North, 7¼d. to 7⅜d. Carbolic acid, 60 p.ct., 1s. 9d. Naphthalene, £13 to £16; salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 6d. to 6½d. per minimum 40 p.ct.; "B" quality, nominal.

FROM A MARKET CORRESPONDENT.

The market in coal-tar products is fairly steady at the moment, although very little business is passing. There is practically no change in pitch, although some irregularity is apparent. One hears of sales as low as 47s. 6d., and, on the other hand, Northern makers are asking up to 55s. There has been some shipping to the Continent on old orders; but this branch of the trade is at a standstill for the present. There are, however, many old "bear" accounts still to be covered-up; so that the demand may continue on this account for some time. Solvent naphtha seems fairly steady at 2s. 10d. per gallon. Naphthalenes remain just about where they were, with a fair demand for crude at £6 10s. per ton and upwards. There is very little demand for refined, which makes £18 to £19 per ton. Carbolic acid remains lifeless. It does not yet pay to take it out, and cannot do so until either the acid is much higher or the creosote much lower in value. The last-named is slightly dearer than it was, at 6½d. per gallon. Cresylic acid is very quiet and without change in price. Business in intermediate products has been slack since my last report; but there is a fair amount of interest, both on home and export account. Aniline oil and salts have been considerably reduced in price by manufacturers to 1s. 1d. and 1s. 2d. per lb. respectively; but so far the new prices have not stimulated any business. There are still a few resale parcels on the market;



DEMPSTER'S PLANT FOR LIGHTLY CARBURETTED WATER GAS.

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and these are obtainable at slightly under manufacturers' prices. Resorcin is rather dearer at 6s. per lb., crude sulphunalic at 1s. 4d., salicylic acid at 1s, and beta naphthol at 2s. 2d.

Sulphate of Ammonia.

The expected demand for sulphate of ammonia for spring use has not yet arrived. There is, indeed, only a very small call for this material on both home and export account; but it surely cannot be much longer before the demand comes along in earnest. The holding-back of orders until so near to the period of usage has not improved the position of consumers, as prices have been advanced against them. Latest advices from America are to the effect that the export demand is becoming very active there, as consumers in countries which do not manufacture this material are relying more and more upon the United States for their supplies; so that it is very difficult to obtain it for later shipment.

Leeds Officials' Salaries.—The Leeds City Council, in response to criticisms, have appointed a Special Committee to review the salaries of the higher-paid officials under the Corporation. The total payment to the nine chief officials at present is £14,673 per annum, as against £8250 in 1914.

Death from Gas by Misadventure.—The Hampstead Coroner returned a verdict of "Death by misadventure" at an adjourned inquest on the body of Edmund Smith, a journalist, who was found unconscious in his room at a boarding-house and died shortly afterwards. Gas was escaping from a ring in the room. It was stated in evidence that Mr. Smith was a very cheerful man, and had no worries. The proprietor of the boarding-house said that the gas-ring and stove in Mr. Smith's room were of a different pattern from those he had had in another room, from which he had recently moved.

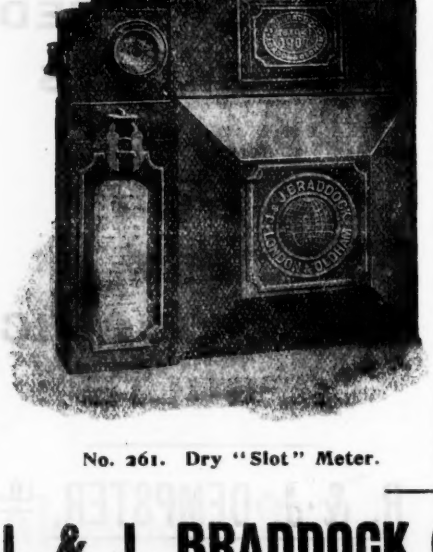
Petrol Gas at Gosberton.—The Gosberton Gas Company sued Mr. G. W. Mann, in the Spalding County Court, for £7 16s. 5d., for gas supplied and goods sold. Half-a-century ago, the Lincolnshire village of Gosberton was provided with coal gas by a private company, which, however, went into liquidation twelve years since, after which the undertaking was run as a private venture for a time; but in February, 1919, the plant was dismantled and sold. Following a demonstration of illumination with petrol gas in the public hall, some of the leading inhabitants asked Mr. E. E. W. Butt, of London, to provide illumination by this means. He formed a Company for the purpose; and petrol gas was supplied from February, 1920, until October of the same year, when the works were closed, as the Company were able to get only 35 consumers for a petrol-gas supply, as against 90 by the old gas company. His Honour Judge Baker found that the Company did supply gas, but that it was of an unsatisfactory quality. He gave judgment for six guineas and costs. The accounts of other consumers are affected by this decision.

Reasons for an Increased Price at Birkenhead.

The reasons why it has been found necessary to increase the price of gas at Birkenhead have been explained to a local newspaper correspondent by Mr. Robert H. Brown (the Gas Engineer), who said that in 1914 the price of gas was 2s. 3d. per 1000 c.ft. It was increased twice in 1915—first in April to 2s. 6d., and then in June to 2s. 9d. This price continued in operation until April, 1918, when it was raised to 3s. 3d. In August, 1919, there was a further increase of 6d., bringing the total up to 3s. 9d. On July 1, 1920, the price was raised to 4s. 3d.; and the present charge of 4s. 9d. per 1000 c.ft. came into operation on Dec. 1. Up to March, 1921, the price of coal had advanced over the 1914 cost by 155 p.ct., gas oil by 215 p.ct., and other materials between 150 and 215 p.ct. At the same time wages had risen 187 p.ct. on an average; while the price of gas in the town had been increased by only 89 p.ct. During the three months' coal strike last year, coal reached as high as £5 5s. per ton (before the strike it was about £2); but some American coal was bought at 75s. The general average was about 84s. per ton. Being able to produce very little coke of their own, the Corporation had to buy furnace coke for the water-gas plant, at the very high price of 80s. per ton. While water gas was being made, there were no residual products which could be sold as an offset to the high prices. In spite of difficulties in obtaining supplies of coal, the Corporation were able throughout the strike to maintain the gas supply both for industrial and household purposes. Since the coal strike, the residual market, from which the undertaking formerly secured a certain amount of income, has fallen heavily. Tar, for instance, which sold at £9 a ton in December, 1920, now fetches only £2 14s. 6d.; and there is no sale for ammoniacal liquor, for which the Corporation formerly received £15 a ton. The coal strike cost them between £35,000 and £40,000; and it is in order to make-up this deficiency that the Committee decided to apply for authority to increase the price of gas.

Hinckley's Low Gas Prices.—Interesting statements were made at a meeting of the Hinckley Urban District Council with regard to gas prices. Mr. G. Kinton, J.P., said there could be only very few (if any) towns in the Midlands supplying gas at a lower rate than Hinckley; and most of them were much higher. The price of their gas was only 66 p.ct. over pre-war; and coal, labour, &c., had increased from 150 to 300 p.ct. The present low price of gas would not have been possible but for the very strong financial position of the undertaking at the time the war started. They had been working on reserves which were now exhausted; and until things were more stable, it would not be a wise policy further to lower the price of gas. It was a matter for congratulation that the Council had been able to supply gas so cheaply, and without a stoppage, during the war and during the recent coal dispute. Consumers of gas and coke were not asked to pay any additional prices during the thirteen weeks the coal pits were closed, though the stoppage cost the Gas Department a considerable amount, and was a source of very great anxiety.

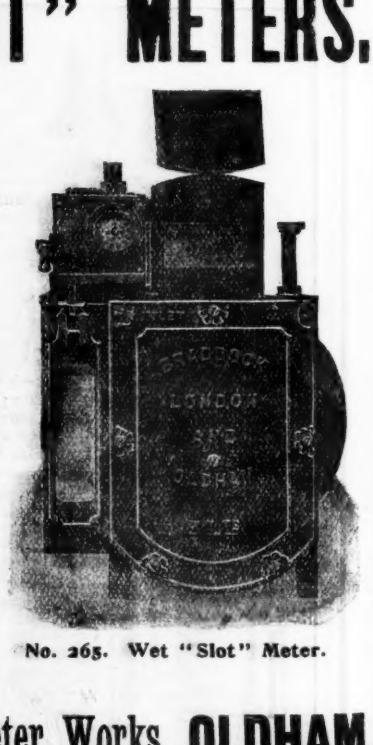
BRADDOCK'S PATENT "SLOT" METERS.



No. 261. Dry "Slot" Meter.

THE BEST SLOTS MADE.

POSITIVE GEARING.



No. 265. Wet "Slot" Meter.

J. & J. BRADDOCK (BRANCH OF METERS LIMITED), Globe Meter Works, **OLDHAM.**

Telegrams—"BRADDOCK, OLDHAM." National Telephone No. 815.

AND 45 & 47, WESTMINSTER BRIDGE ROAD, LONDON, S.E. 1.

Telegrams—"METRIQUE, LAMB LONDON." Telephone No. 2412 HOP.

To a list of New Year favours received which we published on Jan. 4, must be added a handsome desk calendar from Messrs. Stewarts and Lloyds, Ltd.

Owing to the fusing of the electrical installation, the roof and the power cables of Edward's Plating Mills, Newport, were slightly damaged by fire early this month.

Mr. F. J. Rogers, of Messrs. Arden Hill & Co., has been appointed chief Northern representative; and Mr. W. Hoe, who has hitherto represented the Company in the Lancashire district, has now been appointed to the Midlands.

The new purifiers recently installed at the Barrow-in-Furness Gas-Works, by Messrs. R. Dempster & Sons, Ltd., of Elland, are now in full work, and giving entire satisfaction. The plant they supersede had been in operation ever since the works were started, and had ceased to meet requirements.

The Directors of the European Gas Company, Ltd., have decided to pay on the 31st inst. an interim dividend of 5s. per share, free of income-tax.

A report of the City Auditors, presented at the last meeting of the Nottingham Corporation, on the accounts of the municipal trading undertakings for the year ended March last, showed a decreased revenue from gas of £20,938.

A public meeting of the ratepayers of Neath has unanimously approved of the Bill being promoted in Parliament by the Town Council for the extension of boundaries and additional powers in regard to the water, gas, and electricity undertakings.

We have received from Clark's Lead and Colour Works Company, of Reading, a useful two-bladed pocket knife with one face ruled in inches subdivided into sixteenths. The firm will be pleased to forward these knives to any of their gas friends who care to make application.

STOCK MARKET REPORT.

LAST week the Stock Exchange was in better tune; markets in general appeared stronger, and business brightened up. But towards the close there was a little weakening.

The gilt-edged department was in good form. Home Government issues were in excellent case; the big four's Friday figures being: Consols 50⅜—51⅜, War Loan 92 7/16—92 15/16, Funding 76⅛—77⅛, Victory 82⅜—82 13/16. Bonds were being realized.

Business in the Gas Market was bright and fairly active; Gas Lights monopolizing a large share of it, as in the week before. The tone was very firm; a multitude of undertakings advancing their quotations, and some of them to a liberal extent. The three London Companies were strong, and Commercial improved all three issues. In Suburban and Provincial, Alliance and Dublin, Brentfords, Brighton and Hove, British, Ilfords, Plymouth and Stonehouse, three Sheffields, South Suburban, three Tottenhams, and Wandsworth debenture improved. In Continentals, European had a smart rise in view of the approaching dividend; but Imperial went back 3.

Bargains done for cash during the week were as follows; On Monday, Alliance and Dublin 52¼, Bombay 3⅛, Brentford "A" 79⅜, 80, 80¼, Buenos Aires debenture 45, 45½, Commercial 3½ p.ct. 61½, European 6⅝, 6 27/32, Gas Light ordinary 69½, 70, 70⅛, 70¼, 70⅜, Imperial Continental 135, 136, Primitiva preference 39s. 6d., South Metropolitan 75¼, ditto 6½ p.ct. debenture 103¼, 104, South Suburban debenture 73½, 75, Tottenham "B" 62½, Redhill 5 p.ct. "B" 56. On Tuesday, Brentford "A" 80, 80½, ditto "B" 80, Brighton and Hove original 131, Commercial 4 p.ct. 60¾, ditto 3½ p.ct. 62, European 6⅞, Gas Light ordinary 69⅝, 70¼, 70⅜, ditto maximum 52¼, 52⅜, ditto preference 65½, Imperial Continental 135, 136, Primitiva preference 40s., South Suburban debenture 75, Tottenham "B" 63, South Metropolitan 6½ p.ct. debenture 104, Walton and Weybridge 10 p.ct. maximum 7 13/16, 7 15/16, Grays and Tilbury 4 p.ct. debenture 55, 55½. On Wednesday, Bournemouth 5 p.ct. 81½, Brentford "B" 80¾, 81, Brighton and Hove original 135, Commercial 3½ p.ct. 60, 63, European 7, 7⅛, Gas Light ordinary 69⅜, 70, 70¼, 70⅜, ditto maximum 52¼, 52⅜, 52⅝, ditto preference 66½, ditto debenture 51½, Hastings and St. Leonards 3½ p.ct. 50½, Ilford "A" and "C" 86, ditto "B" 63, Monte Video 54, Primitiva 13s. 6d., ditto preference 40s. 3d., South Metropolitan 76½, ditto 6½ p.ct. debenture 103½, 104, 104½, South Suburban 74, ditto debenture 74, Tottenham "B" 65, Folkestone 55, 55½, Southgate 5 p.ct. preference 72, Tottenham 6 p.ct. mortgage 93. On Thursday, Brentford "A" 80, 80½, Commercial debenture 49¾, European 7¼, 7⅜, 7⅜, Gas Light ordinary 69¾, 70, 70¼, 70⅜, ditto preference 66, 66½, ditto debenture 52½, Ilford "A" and "C" 87½, ditto "B" 65, Imperial Continental 133, 134, 135½, Plymouth and Stonehouse 75, Primitiva preference 39s. 6d., ditto debenture 66½, 67, South Metropolitan 75½ 76½, South Suburban 78, ditto debenture 75, Brighton and Hove 5 p.ct. debenture 77, Harrow and Stanmore 5 p.ct. 61. On Friday, Alliance and Dublin 51¾, Bombay 3 11/16, European 8, Gas Light ordinary 70, 70¼, 70⅜, Imperial Continental 134, South Metropolitan 76, 76½, ditto 6½ p.ct. debenture 103½, 104½, Tottenham debenture 56½, Wandsworth "B" 60½, ditto debenture 50, Uxbridge 5 p.ct. 52.

In the Money Market, the position at the opening was as easy as it had closed the previous week; but this was soon succeeded by a smart demand, which sprang up somewhat unexpectedly and lasted the rest of the week. Discount sympathized. Silver was steady. The Bank rate is 5 p.ct., as fixed on Nov. 3.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
182,049	Stk.	Aug. 26	4	4%	Aldershot 4 p.c. Pref.	...	50—55	...
1,551,868	,,	Oct. 13	4½	3 3/8%	Alliance & Dublin Ord.	59—64	50—53	51¾—52¼
374,000	,,	Jan. 12	4	4%	Do. 4 p.c. Deb.	76—79	46—51*	...
280,000	5	Nov. 30	7½	4/-	Bombay, Ltd.	5¼—6¼	5¼—3⅜	3⅛—3 11/16
100,000	5	Aug. 11	16	4/7½	Bournemouth Gas and Water { 5 p.c. B 7 p.c. Pref. 6 p.c. 4 p.c. Deb.	...	7⅜—8¾	8¼
983,110	10	,,	7	7/-		15—15½	8½—9¾	
115,000	10	,,	6	6/-		13¾—14	7¾—8¼	
162,065	—	Dec. 30	—	4%		...	54—59	...
992,045	Stk.	July 15	14	56/-	Brentford A Consolid.	261—266	78—83	79½—80½
734,920	,,	,,	11	55/-	Do. B New	204—209	78—83	80—81
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	68—72	...
221,400	,,	Dec. 15	4	4%	Do. 4 p.c. Deb.	91—93	60—62	...
214,775	,,	Aug. 26	11	10½%	Brighton & Hove Orig.	208—213	132—137	133—135
244,200	,,	,,	8	7½%	Do. A Ord. Stk.	154—159	92—97	...
1,287,500	Stk.	July 28	5	5%	Bristol 5 p.c. max.	...	...	...
530,000	20	Sept. 29	12½	10%	British	44—45	24—26	...
120,000	Stk.	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	88—90	59—64	...
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	43—46	45—45½
100,000	10	May 27	—	6%	Cape Town & Dis., Ltd.	1½—2½	6½—7½	...
100,000	10	Oct. 28	—	4½%	Do. 4½ p.c. Pref.	4—6	4½—5½	...
100,000	Stk.	Dec. 30	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	16—60	...
137,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	...	...
1,515,280	,,	July 28	5/9/4	42/8	Commercial 4 p.c. Stk.	106—108	60—65	60½
560,000	,,	,,	5½	38/4	Do. 3½ p.c. do.	103—105	59—64	60—63
475,000	,,	—	3	3%	Do. 5 p.c. Deb. Stk.	69½—71½	47—50	49½
800,000	,,	Dec. 15	4	—	Continental Union Ltd.	76—79	18—20	...
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—117	33—38	...
51,600	,,	Aug. 26	15	15%	Croydon A 10 p.c.	...	160—165	...
278,400	—	,,	12	12%	Croydon B and C 7 p.c.	...	125—130	...
492,370	Stk.	,,	6	4½%	Derby Con. Stk.	123—125	...	...
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	...	...
1,002,180	10	Jan 29	10	5/0	European, Ltd.	17½—18	7—8	6½—8
16,498,975	Stk.	Aug. 11	1/17/4	46/8	Gas Light and Coke { 4 p.c. Ord. 3½ p.c. max. 4 p.c. Con. Pref. 3 p.c. Con. Deb. 10 p.c. Bonds.	98—102	69—71	69½—70½
2,600,000	,,	,,	3½	35/-		76—79	51—54	52½—53½
4,062,235	,,	,,	4	4%		96—99	65—67	65½—66½
4,674,850	,,	Dec. 15	3	3%		72½—74½	51—53	51½—52½
130,000	,,	Dec. 11	10	10%		...	...	...
82,500	,,	Sept. 14	5	3½%	Hastings & St. L. 5 p.c.	...	...	...
258,740	,,	,,	3½	2½%	Do. 3½ p.c.	87—89	45—55	50½
70,000	10	May 12	11	5%	Hongkong & China, Ltd.	16½—16¾	5—6	...
86,600	Stk.	Aug. 26	9	9%	Hornsey 7 p.c.	...	100—105	...
131,000	,,	July 28	7½	7½%	Ilford A and C	131—134	85—88	86—87½
65,780	,,	,,	6½	5½%	Do. B	115—118	63—66	63—65
63,500	,,	Dec. 30	4	4%	Do. 4 p.c. Deb.	92—94	56—58	...
1,976,000	,,	Oct. 28	9	5%	Imperial Continental	130—160	133—138	133—136
1,333,000	,,	Aug. 11	3½	3½%	Do. 3½ p.c. Deb. Red.	14—86	75—80	...
235,343	,,	Aug 26	6½	6½%	Kea Bridge Ord. 5 p.c.	119—121	72—74	...
2,498,903	,,	Feb. 26	10	37/6	Liverpool 5 p.c. Ord. A. / B.	211—213 / 146—148	...	...
306,083	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	...	...	...
165,736	,,	Aug. 11	9/3/6	6%	Maidstone 5 p.c.	...	54—56	...
63,480	,,	Dec. 30	—	3%	Do. 3 p.c. Deb.	...	40—43	...
75,000	5	June 11	6	5%	Malta & Mediterranean Met. of	4¼—4¾	2—2½	...
250,000	100	Oct. 3	4½	4½%	Melbourne 4½ p.c. Deb.	99—101	93—100	...
341,920	Stk.	Nov. 30	4	6%	Monte Video, Ltd.	12½—13	53—58	54
1,875,892	,,	July 28	4½	3%	Newcastle & Gateh'd Con.	98½—99½	67—69	...
529,705	,,	Dec. 30	3½	3½%	Do. 3½ p.c. Deb.	82—85	50—52	...
15,000	10	Aug. 26	—	7/6	North Middlesex 10 p.c.	...	12½—13½	...
55,940	10	,,	7/14/0	5/3	,, ,, 7 p.c.	14—15	7½—8½	...
300,000	Stk.	Dec. 15	8	8%	Oriental, Ltd.	117—122	84—87	...
60,000	5	—	10	—	Ottoman, Ltd.	7½—7¾	2—3	...
188,120	Stk.	Dec. 30	—	6%	Plym'th & Stonah'se 5 p.c.	...	69—71	75
60,000	50	Aug. 26	15	60/-	Portsea Island, B	128—131	64—67	...
100,000	50	,,	12	55/-	Do. C	128—131	51—54	...
249,980	5	—	5	—	Primitiva Ord.	5¼—6	⅛—⅜	13/16
499,960	5	—	5	—	Do. 5 p.c. Pref.	4¼—5	1 1/16—2 3/16	39/6—40/3
521,800	100	Dec. 1	4	4%	Do. 4 p.c. Deb.	91—93	95—67	66½—67
600,000	Stk.	July 28	4	4%	Do. ,, ,, 1911	...	45—48	...
346,198	,,	Dec. 30	4	4%	River Plate 4 p.c. Deb.	85—87	43—46	...
150,000	10	Sept. 29	6	6/-	San Paulo { 6 p.c. Pref. 5 p.c. Deb.	10½—11	6—6½	...
125,000	50	Jan. 3	5	5%		47—49	33—38	...
135,000	Stk.	Aug. 26	10	5%	Sheffield A	223—224	68—70	...
209,984	,,	,,	10	4%	Do. B	222—224	68—70	...
323,500	,,	,,	10	4½%	Do. C	220—222	65—68	...
155,201	Stk.	Sept. 11	4	4%	Shrewsbury 5 p.c.	...	...	...
90,000	10	Oct. 28	9	8%	South African	10½—11½	7—9	...
6,609,895	Stk.	July 28	5/4/-	5%	South Met. Ord.	111—115	75—77	73½—75
250,000	,,	Jan. 12	—	5%	Do. Red. Pref.	...	94—96*	...
1,895,445	,,	,,	3	3%	Do. 5 p.c. Deb.	72½—74½	49—51*	...
824,820	,,	Dec. 15	8½	4½%	South Shields Con. Stk.	137—139	86—88	...
1,087,705	,,	Aug. 11	6	5½%	S'th Suburb'n Ord. 5 p.c.	114—116	76—81	74—78
368,857	,,	Dec. 30	5	5%	Do. 5 p.c. Deb. Stk.	116—118	72—75	73½—75
647,740	,,	Nov. 16	7½	4%	Southampton Ord.	99—102	57—60	...
121,375	,,	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	...	58—60	...
120,000	,,	Aug. 11	—	6%	Tottenham { A 5 p.c. B 3½ p.c. 4 p.c. Deb.	135—138	72—75	...
782,275	,,	,,	6	4½%		115—117	64—67	62½—65
181,255	,,	Dec. 15	4	4%		87—89	50—50	5½
182,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	...
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	45—50	...
236,476	Stk.	Aug. 26	5	5%	Tynemouth 5 p.c. max.	108½—109	63—67	...
30,000	,,	Aug. 11	8½	66/3	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	151—156	79—81	...
253,636	,,	,,	6½	51/3	Do. B 3½ p.c.	129—134	60—62	60½
108,075	,,	,,	—	46/4½	Do. C	...	57—59	...
140,865	,,	,,	—	46/4½	New Ordinary	...	57—59	...
352,000	,,	,,	6½	45/-	Wimbledon 5 p.c.	117—122	54—56	...
98,000	,,	,,	6½	50/-	Epsom 5 p.c.	121—126	57—59	...
88,416	,,	Dec. 30	5	5%	5 p.c. Deb. Stk.	66—69	49—52	50

* Ex Div.

Gas Charge at Yeadon.—Yeadon District Council are pleased with an intimation of the new charges of the Yeadon and Guiseley Gas Company, under powers conferred by their Order authorizing the adoption of the therm. The Company's application was for a maximum of 1s. 3d. per therm; and the Council opposed it. The maximum allowed is 1s. per therm; and the actual charge now to be made is 10·8d. per therm, which is approximately the same as on the former system of charging by cubic feet.

Hoole and Chester Gas Company's Charges.—A letter from the Chester Gas Company, intimating that they regretted there was no immediate prospect of a reduction in the price of gas, was the subject of a long discussion at a meeting of the Hoole Urban District Council last week. Mr. J. Hewitt moved a resolution to the effect that a meeting of representatives of the various bodies in the area supplied by the Company be called, with a view to getting a bedrock price for gas in the district. The time had come, he said, when the matter should be gone into by a general meeting of these bodies, so that some united protest could be made when the Company's Bill came before Parliament. The resolution was carried.

City and Guilds of London Examinations.—Occasion was taken recently by Mr. W. L. Galbraith, the Secretary of the Gas Light and Coke Company, to present the monetary awards granted to successful candidates in the examinations held by the Company and the City and Guilds of London Institute in Gas Engineering, Coal-Tar Distillation, Coke and Bye-Products, Gas Supply, and Gas-Fitting. Mr. Galbraith said there had been 155 successful passes, showing an increase of 53 over the previous year, and an increase of exactly 100 over 1919. During the war there were not a great number of entries for these examinations; but the Directors were pleased to see the large increases in the past two years, which showed the interest taken by the Company's employees in qualifying themselves for the work they might be called upon to undertake.

Treatment of Gas-Poisoning Cases.—Mr. G. Hewson, of Jarrow, lecturing to the Cleveland Institution of Engineers at Middlesbrough, on the "Treatment of Gas-Poisoning Cases," said the method he proposed to describe had been adopted with great success on Tyneside; and full confidence was reposed in it. Oxygen from cylinders, and the Schafer system of artificial respiration, were applied until the sufferer showed signs of returning consciousness. He was then taken between helpers and walked about; the speed being gradually accelerated until a brisk walk was attained. The advisability of walking a sufferer was warmly questioned in the subsequent discussion. Some speakers quoted satisfactory results from it; while others (including medical men) spoke against the practice. Dr. Howat said the great point to watch was shock; and he emphasized the necessity for keeping the patient warm.

Gas Undertaking Control at Oldbury.—The Oldbury District Council have discussed the question of the control of the gas undertaking, in consequence of a recent decision by the Gas Committee that no reduction should be made in the staff salaries. Several members contended that the salaries and wages under the control of the Gas Committee should come within the jurisdiction of the Salaries and Wages Committee; but eventually a resolution was adopted confirming the right of the Gas Committee to regulate their own salaries and wages, subject to proposed alterations being brought before the Council.

An Increase Agreed to at Walsall.—Reference was again made, at the last meeting of the Walsall Town Council, to the losses that are being made on the gas undertaking, owing to the high cost of coal and the decreased value of residuals. The Council had declined to sanction an increase in the price of gas by 6d. per 1000 c.ft.; and Mr. Tucker now proposed that there should be a rise of 3d. He explained that he was still of opinion that the larger increase was necessary, and said the position had actually become worse during the past month, as the Gas Committee had had to fall into line with Birmingham in reducing the price of coke by 5s. a ton. Alderman Ingram urged that there should be no revision of price until the result of the year's trading was known at the end of March. If the losses proved to be heavy, they could be carried forward, and a proper scheme for meeting them drawn-up. Mr. Forsyth said the members of the Gas Committee knew there was going to be a big deficit on the working of the undertaking, and this would not nearly be met by the suggested increase. Mr. Leckie also pointed out that an interim balance-sheet showed that gas was being sold in Walsall below cost price. At the present time Birmingham gas consumers were paying 1s. per 1000 c.ft. more than Walsall consumers. The recommendation was agreed to.

We are indebted to Messrs. W. G. Beaumont and Son, of Bow, for an illustrated Year Book and Diary for 1922 handsomely bound in cloth and gold lettered.

In view of the fact that, within a very short period during the winter, 456 mantles have been broken on the public gas-lamps in exposed positions in the Hunsworth (Yorkshire) township, the Council last week decided to fix Bray's burners instead of mantles in the more exposed places.

Creditors and contributories of the Hirwain Gas and Coke Consumers' Company, Ltd., met at the Official Receiver's Office, Cardiff, last Friday. No statement of affairs had been lodged; and a resolution was passed that no application be made to the Court for the appointment of a Liquidator in place of the Official Receiver.

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